

CHEMICAL ABSTRACTS

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1—APPARATUS

C. G. DERICK

Standardization of laboratory apparatus. One of the most important tasks of the committee on chemical apparatus. HERMANN RABE. *Z. angew. Chem.* **34**, Aufsatzteil, 177-8(1921); cf. *C. A.* **14**, 1909, 2567; **15**, 454. J. H. MOORE

Laboratory blue burner (Franke Model). HERMANN ZELLER. *Chem.-Ztg.* **45**, 386(1921).—It is claimed that higher temps. than the ordinary Bunsen gives can be reached with half the gas consumption, and that with an equal gas consumption temps. of 1450-1850° can be reached. The top grid to prevent striking back is made of porcelain and cannot burn out. J. H. MOORE

Apparatus for recording the outflow of a graduated buret (hydro-rheograph). H. FREDERICQ. *Arch. intern. physiol.* **15**, 233-4(1919); *Physiol. Abstracts* **5**, 168.—A float on the surface of the liquid in the buret is connected with a metallic counterpoise by means of a thread which passes over a pulley. The counterpoise makes an elec. contact as each cc. of liquid is delivered. JOSEPH S. HEPBURN

Slight changes in gas-analysis apparatus. BÄRENFÄNGER. *Kiel. Chem.-Ztg.* **45**, 466(1921).—In the *detn.* of *S* in the products of combustion with the Drehschmidt app. a cooler is inserted before the absorber. To eliminate trouble caused by drops of H₂O in the capillary tubes of *gas pipets* 2 small bulbs are blown in the tube for drop-catchers. J. H. MOORE

New apparatus for fine carbide analysis. E. VON DRATHEN. *Chem.-Ztg.* **45**, 447(1921); **1** cut.—The app. consists of a separatory funnel with ground stopper mounted with a rubber stopper on an ordinary side-tube filter flask, which is cooled in a H₂O bath. The side-tube of the flask connects with rubber tubing to a 5-l. flask graduated in 50-cc. divisions, the bottom of this flask being extended as a narrow tube graduated in 10-cc. divisions, the total volume of flask and tube being 5900 cc. The lower end of the tube is connected to a 6-l. leveling bottle standing on a platform supported by a cord passing over 2 pulleys to a counter-wt. Both the 5- and 6-l. bottles contain a satd. NaCl soln. To operate, H₂O is placed in the filter flask and 20 g. of the CaC₂ mixed with sand is put in the funnel. The leveling bottle is lowered, the funnel cock opened carefully, and after the reaction the volume of C₂H₂ is read, a long horizontal rod sliding on a vertical Fe support being used to level and make the readings. The bore in the funnel cock tapers from each end, where it is 2.5 mm. diam., to the center, where it is 1.5 mm. diam., so that if it becomes choked it is only necessary to turn it 180° to cause the lump to fall out. J. H. MOORE

Viscosity determinations. L. FISCHER. *Z. angew. Chem.* **34**, Aufsatzteil, 153-4 (1921).—F. describes improvements in his falling-ball viscosimeter for dark and very viscous liquids. It is recommended for gelatin, varnish, etc. E. C. BINGHAM

An easily constructed check valve for water pumps. A. E. ANDELIN. *Hangö. Chem.-Ztg.* **45**, 448(1921); **1** cut.—Bore about $\frac{3}{4}$ through a rubber stopper of 10-12 mm. diam. with about a 5-mm. cork-borer, beginning at the small end, then with a razor cut in from the side far enough to cut off at its base the core made by the cork-borer and pull out the core. Push in a piece of glass tubing almost to the bottom of the hole and slip a rubber stopper about 20 mm. diam. on the other end of the tube, small end toward

the small end of the other stopper, and push down to about 10 mm. of the latter. The large stopper is inserted in a suitable length of glass tubing, the other end being drawn down to receive the hose. This valve is much better than Pinoff's (*C. A.* 15, 3).

J. H. MOORE

An easily constructed check valve for water pumps. ERWIN PINOFF. *Görlitz. Chem.-Ztg.* 45, 448(1921).—P. admits that A.'s valve is better than his own, but states that it is absolutely necessary to place it in a vertical position with the cap of the valve-stopper down.

J. H. MOORE

A new arsenic-reduction tube with electrical heating. K. ZWICKNAGL. *Chem.-Ztg.* 45, 418(1921).—A capillary tube 1-1.5 mm. diam. is drawn in the usual way on a piece of reduction tube about 10 mm. inside diam. Just back of the capillary tube for a distance of 15-20 cm. the tube is softened in the blast and pressed between 2 pieces of asbestos board until the walls are about 2 mm. apart. This flat section is wound with 1 or 2 layers of resistance wire about 0.5 mm. diam. and insulated with asbestos paper. A current of 3 amps. at 120 v. is sufficient for heating, and in use the flat section must lie in a vertical plane. The flat tube prevents the escape of any undecomposed AsH_3 . Instead of generating the H with Zn and acid Thorpe's electrolytic app. is recommended, as there is less danger of As contamination from the reagents. Cf. Birckenbach (*C. A.* 15, 1232).

J. H. MOORE

New cock construction. ANON. *Chem.-Ztg.* 45, 433-4(1921).—A description with 1 cut, of a cock with 2 hand-wheels, 1 of which serves as a lock to hold the plug in place under pressures up to 75 atms.

J. H. MOORE

Improved models of electric water heaters. ANON. *Elec. Rev.* 78, 1028(1921).—Detailed description of 3-gallon heaters.

C. G. F.

Tit8 mills. ANON. *Chem.-Ztg.* 45, 386(1921).—Cut and description of small lab. mills for hand and power.

J. H. MOORE

The pneumercator system of indicating the exact contents of tanks. ANON. *Intern. Sugar J.* 23, 263-5(1921).—The actuating part of this app. is an inverted, hollow hemispherical vessel, placed at the bottom of the tank. It has a sharp-edge orifice in its side, which marks the zero level. A small pipe connects the top of the chamber with a Hg-gage. Since the liquid level rises a little in the chamber when the tank is being filled, a small hand air pump is placed near the gage, by means of which the liquid level in the chamber can be readjusted to the zero mark, the gage being disconnected at the time through a control valve. The latter can also be set to vent the system and check the zero mark of the gage. One gage may be placed at any desired distance for any number of tanks to be registered, and an electric annunciator system can also be directly connected through the Hg column in the gage. Illustrated.

F. W. ZERBAN

A hydrogen electrode vessel adapted for titrations (HASTINGS) 11B. Interferometry (LÖWE) 7.

MÖLLER, H. G.: Die Elektronenrohren et leurs applications pratiques. Braunschweig: F. Vieweg. 162 pp. For review see *J. chim. phys.* 18, 446(1920).

2—GENERAL AND PHYSICAL CHEMISTRY

W. E. HENDERSON AND EDWARD MACK

Recent advances in science—physics. I. F. BATES. Univ. Bristol. *Sci. Progress* 15, 537-41(1921).—Review of physico-chem. interest. JOSEPH S. HERBURN. Some triumphs of modern chemistry. THOMAS P. MCCUTCHEON. Univ. Penn-

sylvania Bull. 21, No. 18, 247-61(1921).—An address reviewing recent advances in inorg., org., and industrial chemistry. JOSEPH S. HEPBURN

Award of the Nichols Medal to Gilbert N. Lewis. ANON. *Chem. Met. Eng.* 24, 869(1921). An appreciation of the medalist. ARTHUR B. LAMB. *Ibid* 869-71. Presentation. JOHN E. TEEPLE. *Ibid* 871. E. H.

History of alcoholic fermentation in ancient China. G. WANG. *Science (China)* 6, 270-82(1921).—The old literature reveals specifications for preparation of the malt, which are essentially those followed in the scientific industry today. The books of 1000 B. C. read like the treatises of the later European alchemists. Wm. H. ADOLPH

Chemical instruction in the higher schools. WILLY GRÄFE. *Z. angew. Chem.* 34, Aufsatzteil, 60-1(1921). E. H.

British pyrometry practice. ERNEST J. DAVIS. *Foundry* 49, 463-7(1921).—A review. E. H.

Methods for the production and measurement of high vacua. SAUL DUSHMAN. *Gen. Elec. Rev.* 24, 436-43(1921); cf. *C. A.* 15, 460.—In this installment S. discusses clean-up of residual gases by Ca metal, by incandescent W, and by elec. discharge. Numerous references to the literature are given. C. G. F.

The color and molecular formula of water and ice. E. TOMKINSON. *Chem. News* 122, 205-8(1921).—Notes on various expts. by different workers on this subject. There are 4 theories to explain the color of water and ice. (1) The blue color of pure water and ice is due to selective absorption of rays of complementary color, perhaps due to the mol. aggregation. (2) The color is due to the scattering of light by suspended particles. (3) The color is due to a sky-effect. (4) In the case of sea water, it is due to dissolved org. matter. It is thought that (1) and (4) explain all the observed facts. E. H. DARBY

Density, refractive index and dispersion of gaseous nitrogen at its boiling point. ERICH GEROLD. *Univ. Leipzig. Ann. Physik* 65, 82-96(1921).—The method and app. employed are described. The mean of several density (d) measurements of gaseous N at 77.75° abs. and 741.10 mm. is $d = 0.0044973 \pm 17.10^{-7}$. The following values were obtained for the refractive index of gaseous N (n_0) at 752.32 mm. pressure and 77.97° abs. for light of the designated wave-length: $\lambda = 643.9$, $n_0 = 1.001077$ (9); $\lambda = 546.1$, $n_0 = 1.001084$ (7); $\lambda = 435.8$, $n_0 = 1.001100$ (7). From these d and n_0 values the true refractive index of liquid N (n_f) at 745.12 mm. pressure and 77.12° abs. has been calcd. for light of several wave-lengths. Wiener's "form-number," u , (cf. *C. A.* 6, 950), a factor which depends on the shape of the mols., has been calcd. by means of the equation: $u = [n_f^2 \cdot d_f(n_0^2 - 1) - n_0^2 \cdot d_0(n_f^2 - 1)]/[d_0 \cdot (n_f^2 - 1) - d_f \cdot (n_0^2 - 1)]$, and a mean value 2.16 ± 0.04 ($T = 77.12^\circ$) obtained, thus indicating that at this temp. the N mol. behaves dielectrically as though it were approx. spherical. It is shown that the value of u increases as the wave-length of the light decreases, showing that in its dielectric behavior the N mol. is almost spherical with red light, while with violet light it deviates from this form. H. JERMAIN CREIGHTON

Some physical properties of hydrocarbons containing two and three carbon atoms. O. MAASS AND C. H. WRIGHT. *J. Am. Chem. Soc.* 43, 1098-1111(1921).—Some physical consts. of ethane (I), ethylene (II), acetylene (III), propane (IV), propylene (V) and allylene (VI) have been detd. *Melting points*: I,—172.0°; II,—169.4°; III,—81.8°; IV,—189.9°; V,—185.2°; VI,—104.7°. *Unsatn.* causes a rise in m.p. In the 2- and 3-carbon hydrocarbons, passing from satn. to ethylene linkage causes a rise of 3° to 4°, from ethylene linkage to acetylene linkage causes a rise of 81° to 87°. In each of the series the 3-C compd. has the lowest m.p. *Vapor pressures and critical temps.*: Tables of vapor pressures are recorded, from which the following b.ps. are read: I,—83.3°; II,—103.9°; III,—83.6°; IV,—44.5°; V,—47.0°; VI,—27.5°. *Critical temps.* are: I, 35.0°; II, 9.9°; III, 36.5°; IV, 95.6°; V, 92.1°; VI, 127.9°. The b. ps. are approx.

equal fractions (0.60 to 0.62) of the critical temps. *Densities*.—Curves show that the ds. vary almost linearly with the temp.: I, from 0.5719 at -108.2° to 0.5272 at -74.0° ; II, 0.5762 at -108.7° to 0.5172 at -69.45° ; III, 0.6181 at -81.8° to 0.5763 at -55.2° ; IV, 0.6238 at -78.2° to 0.5615 at -24.5° ; V, 0.6486 at -78.2° to 0.5183 at $+19^\circ$; VI, 0.7128 at -55.3° to 0.6600 at -12.9° . Taking V as a standard, calcns. of the ds. of the other hydrocarbons based on van der Waals' equation of corresponding states give results agreeing excellently with the observed values. *Surface tension*.—Curves show that the surface tensions vary linearly with the temp.: I, from 19.17 at -108.2° to 13.73 at -74.0° ; II, 18.10 at -112.4° to 13.66 at -88.3° ; III, 19.28 at -81.8° to 14.31 at -56.0° ; IV, 19.63 at 71.0° to 14.95 at 39.1° ; V, 18.93 at -62.0° to 13.17 at -22.9° ; VI, 22.61 at -52.6° to 16.97 at -15.8° . Calcns. of the critical points from the above data give results agreeing well with the observed values except for VI, which is somewhat associated.

JAMES M. BELL

The number of molecules per cm^3 of oxygen determined from its dispersion. C. STĂTESCU. *Bull. sec. sci. acad. Roumaine* 6, 164-7 (1919-20).—The dispersion formula of Cauchy, $n^2 = A + (B/\lambda^2)$ is the starting point in this deduction. Here A and B are defined from the Drude electronic theory as: $A = 1 + N_e/\epsilon_0$, and $B = N_e\theta_e/\lambda^2$. In these expressions N_e is the no. of electrons of wave length λ_e per cm^3 ; θ_e is the facility with which the electrons can be displaced from their original position, or the inverse of the force which holds an electron in a position of equilibrium. The wave length of a certain kind of electrons in the ultraviolet may be obtained from $\theta_e = \lambda_e^2/(4\pi)(e/me)$ where e and m have the usual significance of charge and mass. From the 4 above equations N_e is calcd. If P_v is the valence, $N = N_e/P_v$ is the no. of mols. per cm^3 . For O $A = 1.000539$, $B = 0.5326 \times 10^{-13}$, $\theta_e = 4.904 \times 10^{-24}$, $N_e = 10.99 \times 10^{19}$ and $N = 2.73 \times 10^{19}$. This latter agrees well with 2×10^{19} calcd. from the kinetic theory, 2.76×10^{19} from Planck's laws of heat radiation, 3.1×10^{19} from Perrin's Brownian movement, Rayleigh's value of 2.47×10^{19} , Millikan's value from the detn. of e of 2.65×10^{19} and Rutherford's e from α -rays, 2.78×10^{19} .

G. L. CLARK

Search for a new atmospheric gas. C. BOREL AND A. JAQUEROD. *Arch. sci. phys. nat.* 2, 265 (1920); *Science Abstracts* 23A, 546.—Paper read before the Soc. Suisse de Physique. Although there is apparently no room for an unknown gas among the elements, the authors wished to ascertain whether certain auroral lines, notably 557, were possibly due to an atm. constituent. They tried diffusion through quartz. In the first series of expts. ordinary air was heated in a quartz vessel to 350° ; the diffused gas was drawn off every day. After two months 1 cm. of gas was collected which gave the spectrum of He and, less brilliantly, also H and Ne lines, but no new lines. In the second series an air-liquefaction residue, received from G. Claude, was fractionated; the He portion was then twice diffused through hot quartz. No other gas was found. E. J. C.

Variations in the density of air. A. JAQUEROD AND C. BOREL. *Arch. sci. phys. nat.* 2, 411-3 (1920); *Science Abstracts* 24A, 95.—Paper read before the Soc. Suisse de Physique. The authors describe briefly some refined detns. of the density of air, made by them at Neuchâtel, with the object of investigating the unexplained variations in the density pointed out by Morley as long ago as 1875. The law of Loomis-Morley is confirmed, namely, that the max. density is found with samples of air taken when the atm. pressure is a minimum, and *vice versa*. Differences of compn. do not seem sufficient to explain these variations, and Guye has suggested that the cause is to be found in the presence of ultra-microscopic dust. To test this, the authors propose to expt. with air from which dust has been removed electrically. Samples of air obtained by aeroplane from altitudes between 2 km. and 3 km. have been tested and appear to be subject to the same variations of density as the surface air. E. J. C.

Composition, ionization, and viscosity of the atmosphere at great heights. S. CHAPMAN AND E. A. MILNE. *J. Roy. Meteorol. Soc.* 46, 357-66; *Disc.*, 366-8, Oct.

1920; *Science Abstracts* 24A, 93-4; cf. *C. A.* 15, 1099.—*Composition.*—Evidence of the presence of H in the stratosphere is not conclusive, and the compn., pressure, and d. of the atm. at great heights have accordingly been recalcd. both on the assumption that H is present and that it is not. If it is absent, then above 150 km. the atm. is almost entirely He. It is shown that the hypothetical geo-coronium, suggested by Wegener, could not be retained by the earth on account of the low mol. wt., 0.4, so this gas is not considered as being present. The effect of mixing in the troposphere is to render the compn. of the atm. practically the same throughout this region. There is, however, no reason to suppose that mixing ceases suddenly at the top of the troposphere, for although it would tend to destroy the nearly isothermal condition of the stratosphere, yet the effect of a limited amt. would be counteracted by radiation. A theoretical examn. is accordingly made of the effect on the compn., etc., at great heights of varying the level at which diffusive sepn. of the gases commences and the calcs. are performed, taking this height successively as 12 km., 20 km., 30 km., and 50 km. The general result is that up to about 100 km. there is little effect on the pressure and d., but above 150 km. these are very sensitive to variation in the assumed height at which mixing ceases. *Ionization.*—Using the results of these calcs., the distance to which α -particles could penetrate the atm. from outside is investigated. Assuming the particles to possess, at the outer fringes of the atm., velocities such as are observed with α -particles emanating from radio-active substances, it is found that, if incident directly, the fastest could penetrate to a height of 80 km. and the slowest 85 km., and this is independent of the level at which diffusive sepn. is supposed to commence and of the presence or absence of H. This result is to be contrasted with that of Vegard who, using Wegener's pressures (geo-coronium present) finds, for example, that the height reached would be 200 km. for α -particles with the initial velocity of those from Ra C. The importance of these results is in their bearing on the theory of auroras (which are confined to the layer 100 km. to 130 km.), that they are the manifestation of the absorption by the atm. of α -particles emitted by the sun. The penetration of the atm. by β -rays and γ -rays is also considered. They would give rise to two well-marked layers of max. ionization at about 54 km. and 26 km. resp. *Viscosity.*—As regards viscosity, there is a rapid increase in the effective kinematical viscosity at great heights owing to the decrease of d. E. J. C.

Application of the idea of tension of expansibility to the study of diffusion. L. GAY. *J. chim. phys.* 18, 103-25 (1920).—A theoretical paper. The variation of the compn. of a liquid mixture with the level is deduced. The expression $X = (-RT) \cdot (\partial \log \pi / \partial x)$ is derived, where X is the component of the force of diffusion in the direction x , and π is the tension of expansibility. Then follows the development, from the kinetic theory, of a general theory of the phenomena of diffusion, either for mixts. of perfect gases, or for mixts. of liquids. Equations are deduced for the relation between the coeff. of mutual friction of 2 kinds of mols. and the sphere of mutual repulsion in gas mixts., and the sphere of impenetrability in liquid mixts. Knowing the coeff. of mutual friction of the various species of mols., equations for their velocity of diffusion are derived. Finally, for a mixt. of 2 perfect gases, or 2 normal liquids, which do not react chemically, an equation is developed for the reciprocal mol. coeff. of diffusion of the 2 constituents.

R. H. LOMBARD

Determination of the velocity of sound in gases at different temperatures. F. HIMSTEDT AND R. WIDDER. *Z. Physik* 4, 355-9 (1921).—H. and W. describe an app. small enough to be placed in a Dewar flask, in which the gas is inclosed in a small brass tube, the frequency of the sound wave to which this tube will resonate being detd. This frequency is proportional to the velocity of sound in the gas. The ratio of the velocities in air at 20 and -78.73° is found to be 0.8147. F. C. HOYT

Molecular size and range of molecular attractions in solutions. J. B. LEATHES. *Nature* 107, 138-9 (1921).—The radius of the mols. of starch and many proteins must

be of the nature of 50 Å., which is also the value commonly assigned to the radius of sphere of mol. attraction. From this standpoint surface behavior and the difference in behavior of colloidal and ordinary solns. are discussed. MARIE FARNSWORTH

The determination of the density and charge of selenium particles. R. BÄR AND F. LUCHSINGER. *Physik. Z.* 22, 225-30(1921).—The Ehrenhaft-Millikan method for detn. of the size and charge of microscopic and ultramicroscopic particles gives correct results providing that the two underlying assumptions hold: (1) that the motion of the particles under the influence of an outside force follows the Stokes-Cunningham law; (2) that the particles are spherical and possess the d. of their parent material. The results as observed on Se particles obtained by vaporization in N are generally correct down to a particle radius of about 3.5×10^{-6} ; but with smaller particles the Stokes-Cunningham law does not hold, thus leading to erroneous results in estimating the charge of an electron. Furthermore the Se particles show differences in d. Probably these errors affect the work of Ehrenhaft and his pupils. Work is in progress to find a resistance law to replace the Stokes-Cunningham law in the case of very small particles. JEROME ALEXANDER

Colloids and colloidal electrolytes. J. W. MCBAIN. *Nature* 107, 46-8(1921).—A discourse. W. H. ROSS

The nature of the emulsoid colloid state. (Letter by) S. E. SHEPPARD and (criticism by) J. W. MCBAIN. *Nature* 107, 73-4.—Attention is directed by S. to the difficulties attending the explanation of sol and gel formation in non-aq. solvents by soaps of Al, Fe, etc., according to the 'ionic micelle' theory of J. W. McBain. It is suggested that the formation of micelles, as the 'smallest plurimolecular units of such colloids, is itself consequent on submolecular orientation of definite atom-groups, in a development of the orientation theory of surface and interfacial tension due to W. B. Hardy, I. Langmuir and W. H. Harkins. Solvation is regarded as limited, for a given substance forming an emulsoid colloid, to part only of the mol., the remaining non-solvated atom-groups undergoing mutual orientation and attraction, thus producing a stratichem. field of force responsible for the pattern of behavior of a given colloid. The hypothesis is more specifically developed for proteins and soaps. In criticism of this suggestion, McB. agrees that the conception is sufficiently elastic to conform to many of the facts, but objects to the diminution of significance of the word "dissolved" when applied to a soln. where both "undissolved" and "dissolved" parts are in a state of mol. subdivision. The instances of colloid gold of highest dispersity, of rubber gels in benzene, of Cd and CdO alcogels, are urged as irreconcilable with the foregoing suggestion, as also the continuity of sol and gel in aq. soap solns. McB. concludes that the hypothesis is at present too vague to replace existing conceptions. S. E. SHEPPARD

The adsorption of arsenious oxide by metastannic acid. T. R. BRIGGS AND W. J. BARTLETT. *Trans. Am. Electrochem. Soc.* 37, 449-59(1920).—Exptl. data show that adsorption of As_2O_3 in soln. by $H_2Sn_2O_5$ decreases with rising temps. At ordinary temps. the adsorption takes place from solns. contg. H_2SO_4 or H_2SO_3 and $CuSO_4$, the acid tending to cut down the adsorption. The adsorption equil. is reached rapidly and is reversible. Adsorbed As_2O_3 has a peptizing action on $H_2Sn_2O_5$. The presence of impurities more strongly adsorbed than As_2O_3 should decrease adsorption of the latter and may account for the unreliability of the Gruessner and Badt method of As removal from spent electrolyte. W. H. BOYNTON

Changes in the electrical resistance of carbon by gas absorption. K. SIEBEL. *Kiel. Z. Physik* 4, 288-99(1921).—The absorption of air or NH_3 at 1 atm. in a C filament raises its resistance slightly; the increase reaches a const. value only after several days. This limiting value increases with gas pressure. The temp. coeff. of resistance also increases with increasing time of absorption. NH_3 has a greater effect than air. F. C. HOYT

The nature of the swelling process. E. KNOEVENAGH and O. EBERSTADT. *Kolloidchem. Beihefte* 13, 193-212(1921).—"Chloroform-soluble" acetylcellulose does not swell in pure water or in abs. alc., but swells strongly in mixts. of the two, as well as in dil. HCl, acetone, and AcOH. The degree of swelling may be checked gravimetrically or by measuring microscopically the increase in diam. of a section of "horse hair" acetylcellulose. While unswollen acetylcellulose is dyed to deep shades or saponified by NaOH only with difficulty, the swollen material is readily dyed, and is saponified even at room temp. This swelling effect is the basis of a patent for dyeing acetylcellulose in a bath contg. alc. acetone, AcOH, etc.

JEROME ALEXANDER

Supersaturated solutions, observed in mixtures of wax and rosin. G. JAHN. *Kolloidchem. Beihefte* 13, 213-32(1921).—According to concn. and temp. rosin-wax mixts. may be one fluid, two solid solns. or three mixts. in which there is a balance between solid soln. and pure wax. Up to 25% wax, solid solns. are formed, and these may be supersatd. with wax by quick chilling. The wax mols. gradually diffuse through the solid rosin, forming a turbidity which may be estd. photometrically; the ductility is thereby decreased. The "life" of the supersatd. soln. increases with time of heating, mixing, and thickness of the prepn., but decreases with the concn. [Quite similar phenomena have been observed in mixts. of soap, fatty acids, and metals. ABSTR.]

JEROME ALEXANDER

Knowledge of solubility. V. The solubility of salts of aromatic acids and their amines. FRITZ EPHRAIM. Univ. Berne. *Ber.* 54B, 965-73(1921); cf. C. A. 15, 2027.—A study has been made of the soly. of salts of aromatic acids and of their NH_3 addition products, by means of pptn. expts. in which solns. of chlorides of Ni, Cu, Cd, Zn, their amines, $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ and $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ were added to solns. of (1) monosulfonic acids, (2) Cl-, Br- or NO_2 -substituted monosulfonic acids, and (3) di- and trisulfonic acids. The characteristics of the various ppts. obtained are tabulated. In general it has been found that the following relations between soly. and constitution hold for salts of aromatic acids with metals of small at. vol. (e. g., Ni, Co, Cu, Cd, Zn): (1) Collectively the salts of Cl-, Br- or NO_2 -substituted sulfonic acids, regardless of the position of the substituting group, form very difficultly sol. NH_3 addition products, while the NH_3 -free salts are in all cases more easily sol. than the corresponding amines; (2) all sulfonic acids which do not contain these substituents form very easily sol. salt-ammines (with the exception of 1,2-xylene-4-sulfonic acid), these salt-ammines being more sol. than the corresponding NH_3 -free salts.

H. JERMAIN CREIGHTON

The penetration of iron by hydrogen. T. S. FULLER. *Gen. Elec. Rev.* 23, 702-11 (1920).—F. reviews work on the permeability of Fe to gaseous H and nascent H. An app. developed for detg. the effect of current, treatment of the Fe, temp., electrolyte and surface coating on the penetration of Fe by nascent H consists of a seamless Fe tube plugged at the bottom, and sealed at the top to a glass U-tube having one arm closed and calibrated, and the other open. The app. is completely filled with Hg. When it is in operation the H that penetrates the tube displaces the Hg in the closed and calibrated arm of the U-tube. The finished unit is so arranged that the electrolyte comes in contact with only glass and Fe. The rate of penetration increases with the temp. and is greater for Fe immersed in 1% H_2SO_4 than for Fe electrolyzed as cathode in a similar soln. Cu is impervious at ordinary temps. and Zn-coated Fe shows decreased penetration, while coating with Sn increases it. Penetration velocity increases with each successive electrolysis, and with acid "pickling." The app. is illustrated and results of all expts. are tabulated.

W. H. BOYNTON

The elementary quantity of energy of solution. RENE AUDUBERT. *Compt. rend.* 172, 876-8(1921).—It is found that a relation analogous to that of Pictet-Trouton holds for solns. If ρ is the mol. heat of soln. and T is the temp. which corresponds to a satd. soln. with an osmotic pressure of 1 atm. then ρ/T is found to be approx. const.

for solns. of various salts, as KCl , BaBr_2 , K_2CO_3 , $\text{Al}_2(\text{SO}_4)_3$, etc. This value is obtained by plotting the osmotic pressure, π , against ρ/T and extrapolating to $\pi = 1$ atm. ρ/T at this point comes out 30 to 32. Dividing by Avagadro's no. gives 18×10^{-16} Terg of energy necessary to cause one molecule to pass into soln. against 1 atm. osmotic pressure. This is numerically the same as the energy of dissociation of one mol. of NH_4Cl and it is suggested that soln. and sublimation are equiv. phenomena. A. E. STEARN

The empiric formula of Walden and the theory of Ghosh. MILLER, H. KADLCOVÁ. *Chem. Listy* 15, 109-10 (1921).—The values obtained for the empiric const. of Walden (*C. A.* 14, 2437) $D\sqrt{v}$ as detd. by himself and those resulting from calcs. according to the theory of Ghosh (*C. A.* 12, 1609; 15, 977) for different degrees of dissociation, although in close agreement, are not identical. Since a comparison of the results of both Walden and Ghosh leads to the conclusion that for a definite degree of dissociation the value of $D\sqrt{v}$ is a const., it may also be concluded that an electrostatic attraction really exists in soln. between electrolytic ions having charges in agreement with the charge of ordinary electrons. The supposition of Ghosh that strong electrolytes are completely dissociated especially in concd. solns. does not seem warranted. JOHN M. KRNO

The activity coefficient of strong electrolytes. GILBERT N. LEWIS AND MERLE RANDALL. *J. Am. Chem. Soc.* 43, 1112-54 (1921).—Electrolytic dissociation formulas valid for weak electrolytes are not adequate to account for the behavior of strong electrolytes. For a study of the latter a knowledge of their activity coeffs. is important. The authors show how these data may be obtained from (1) the vapor pressure of the solute, (2) distribution ratios, (3) the vapor pressure of the solvent, (4) e. m. f. of cells, (5) f. p. data. Tables and charts are given comparing the values obtained by these different methods. If in any soln. of strong electrolytes, the stoichiometrical molality of each ion be multiplied by the square of the valence of the ion, one-half the sum of these products is termed "the ionic strength" of the soln. Using this conception the authors give the following general rule. The activity coeff. of every strong electrolyte (and the individual activity coeff. of every ion) is the same in all dil. solns. of the same ionic strength. It is, therefore, independent of the number and nature of the ions composing the soln. The paper is concluded by a discussion of electrolytic dissociation.

EARL E. LIBMAN

Influence of salts on chemical equilibria in solutions. J. N. BRÖNSTED. *J. Chem. Soc.* 119, 574-92 (1921).—Most equilibria into which salts enter in aq. solns. are not distinguished by real constancy of the equil. "constant." The increase in soly. caused by the addition of heteroionic salts is a function of the valence of the ions of the satg. salt. Brönsted infers the existence of very high interionic forces in the cases of multivalent ions. No regard, however, is paid in these calcs. to the markedly individual behavior of ions of identical types and the results are stated to be approx. His results rigidly support the law of mass action and the gas laws in the case of equilibrium established in relatively strong salt solns. of const. concn. Thus the addition of salts to a soln. of an acid decreases the activity coeff. but increases the activity of the undissociated mols. and if the acid be weak enough its total activity must be increased, the mass action coeff. varying as the ratio of the activity coeff. for the mol. to the product of that of each ion. In sugar inversion the product of the relative velocity and the acidity coeff. is a const. Sparingly sol., weak acids show a max. soly. at a definite salt concn. In regulator mixts. the influence of the changing medium on the activity of the H is independent of the influence on its activity coeff. The presence of impurities may be detected by the activity const. method. With indicators a given activity of the H will produce the same color only in solns. having the same ratio of ionic activity to mol. activity. From the point of view of complete dissociation of electrolytes there appears to be an increase in the dissociation of weak electrolytes on the addition of salts to their solns.

H. W. POST

The hydrolysis of dichloro and hexa-aquo chromic chlorides. ARTHUR B. LAMB AND GORTON R. FONDA. *J. Am. Chem. Soc.* 43, 1154-78(1921).—The uncertainty of the hydrolysis consts. of the 2 salts is pointed out. That of the dichloro chromic chloride was detd. by 2 methods, the modified Walker method giving a value $K_2 = 1.8 \times 10^{-4}$, and the Bjerrum method $K_2 = 2.0 \times 10^{-4}$. The hydrolysis const. of the hexa-aquo chloride detd. by five methods over a wide range of temps. averaged $K_2 = 1.58 \times 10^{-4}$ at 25°, with an av. variation of 5%. *Hydrogen-ion concn.* is easily detd. by adding small amts. of dichloro chromic chloride to a soln. and observing its change in cond.; the results are not affected by small amts. of Cl ions. JEROME ALEXANDER

Influence of the geometric form of solids on chemical reactions taking place in contact with them. G. REBOUL AND R. LUCE. *Compt. rend.* 172, 917-8(1921); cf. *C. A.* 7, 2000.—Further data going to show that the rate of chem. reactions taking place in contact with solids and gas is a function of the geometric form of the solid, the rate of reaction being greatest at the points where the radius of curvature of the solid is least.

E. H. DARBY

Adsorption catalysis. M. POLANYI. Berlin. *Z. Elektrochem.* 27, 142-50(1921).—It is shown on theoretical grounds, in accordance with modern knowledge of the nature of fields of force at solid surfaces of contact, that a very marked reaction acceleration must occur at such surfaces of contact. The order of magnitude of this acceleration has been calcd. and a number of approximation formulas for velocity of reaction derived. All velocity consts. have the general form $k \sim S e^{-W/RT}$, where S is a const. and W is the heat of action. For certain types of reactions W is equal to the heat of reaction. The heat summation of the endothermic "elementary reactions" which make up a reaction is determinative for the velocity of the reaction. At solid surfaces of contact this heat summation is reduced in such a way that it conditions a very marked acceleration in the velocity of reaction, which at ordinary temp. is 10^3 -fold.

H. JERMAIN CREIGHTON

The chlorination of methane in stages and the valence energy in the chloromethanes. F. MARTIN AND O. FUCHS. Techn. Hochschule, Darmstadt. *Z. Elektrochem.* 27, 150-62(1921).—A theoretical and mathematical paper in which the valence energy between the C and Cl atoms in chlorinated methanes has been calcd. Approx. the same values have been found for the different substitution products, from which it follows that in the stepwise chlorination of CH_4 the same driving force is exerted in each stage of the reaction. It is deduced that under similar conditions the ratio of the velocity consts. of the successive stages of chlorination is proportional to the number of H atoms displaced by Cl. On the basis of these ratios (4:3:2:1) the course of the chlorination of CH_4 with time has been calcd. and constructed graphically. The theor. and exptl. results are in agreement in the neighborhood of 300°; at higher temps., especially in the presence of catalysts presenting large surfaces, the higher chlorinated products are formed in a larger proportion than is demanded by theory. In conclusion several formulas for general cases of bimol. stepwise reactions are derived.

H. JERMAIN CREIGHTON

The heat capacity of water between 5° and 50° in international joules. W. JAEGER AND H. V. STEINWEHR. *Ann. Physik* 64, 305-66(1921).—A very elaborate presentation. A horizontal cylinder of 50 l. was used, completely inclosed by its water jacket, with the usual electric heating (0.8 kw.), and temp. measurement by elec. thermometers. The calcn. formulas are worked out in detail and an unprecedentedly full discussion of the effect of variations in jacket temp. is given. The speed of stirring was dictated by the demands of the resistance thermometer. Of 67 expts. 5 showed a discrepancy over 1 per mille. The mean value for the 15° calorie is put at 4.1842; the min. of heat capacity at 335°.

W. P. WHITE

Specific heats of some organic liquids. ROBERT TRÉHIN. *Ann. phys.* 15, 246-63

(1921).—A rather simple method was used, with a Dewar* calorimeter, elec. heating and adiabatic jacket. The thermometer was read only to 0.01°. The precision appears to have been usually better than 1%. The *sp. heat of benzene* was found to be $0.405 + 93 \times 10^{-5}$ ($\theta^\circ - 15^\circ$) from 16° to 58°, of *acetone* $0.510 + 80 \times 10^{-5}$ ($\theta^\circ - 15^\circ$), and CHCl_3 $0.226 + 33 \times 10^{-5}$ ($\theta^\circ - 15^\circ$).

W. P. WHITE

Specific heat and cohesion. W. FRAENKEL. Frankfurt. *Z. Metallkunde* 12, 514-5(1920).—F. criticizes as incompetent, superficial and misleading a paper by A. van der Werth in *C. A.* 14, 3006.

W. P. WHITE

The process of solidification as a problem of conduction of heat. H. C. BURGER. *Proc. Acad. Sci. Amsterdam* 23, 616-27(1921).—The growth of solid particles in an undercooled liquid is mainly conditioned by the effectiveness of the conduction of the surrounding material in getting rid of the latent heat. General equations are given for the boundary conditions of conduction at the interfaces. The only particular problem treated in detail is solidification of a highly undercooled liquid in a cylindrical tube with the simplifying assumption that the interface is a plane surface perpendicular to the axis. The answer to this is given in a complicated mathematical form unsuitable for reproduction here but comparison with exptl. observation is promised in a subsequent paper.

E. D. WILLIAMSON

Observations of temperature during solidification. H. C. BURGER. *Proc. Acad. Sci. Amsterdam* 23, 691-704(1921); *Verslagen Akad. Wetenschappen Amsterdam* 29, 288-301.—Salol was chosen as a convenient substance to expt. with in an initial test of the theoretical results already obtained (see preceding abstract). A very fine thermoelement passed along a diameter of the cylindrical tube in which the expt. was performed and the galvanometer deflection was registered photographically as the material crystd. A max. temp. was reached when the solid-liquid boundary reached the thermoelement, but this max. was always below the m. p. of the solid. The temp. curve agreed well with theory.

E. D. WILLIAMSON

Vapor pressure tables for temperature determinations between +25 and -185°. ALFRED STOCK, FRITZ HENNING AND ERNST KUSS. *Ber.* 54B, 1119-29(1921).—Measurements have been made at 1° temp. intervals of the vapor pressure of (1) CS_2 between 11 and -18°, (2) SO_2 between -12 and -57°, (3) NH_3 between -35 and -77°, (4) CO_2 between -78 and -110°, (5) HCl between -85 and -111°, (6) PH_3 between -90 and -133°, (7) C_2H_4 between -110 and -141°, (8) CH_4 between -163 and -181°, (9) O_2 between -179 and -185°. By means of the tables containing the data obtained by these measurements, any temp. between room temp. and -185° can be measured easily by means of tension thermometers with an accuracy of 0.1°. The following values have been found for the consts. in the Nernst vapor pressure formula,

$$\log p = -(a/T) + 1.75 \log T - bT + c:$$

	a.	b.	c.
CS_2	1682.38	0.0052980	5.44895
SO_2	1561.36	0.0061757	6.20476
NH_3	1393.60	0.0057034	5.89654
CO_2	1279.11	0.0020757	5.85242
HCl	905.53	0.0050077	4.65739
PH_3	845.57	0.0061931	4.61480
C_2H_4	834.13	0.0083753	5.32340
CH_4	472.47	0.0096351	4.60175

H. JERMAIN CREIGHTON

Vapor pressures of some salts. H. V. WARTENBERG AND PH. ALBRECHT. *Techn. Hochschule, Danzig. Z. Elektrochem.* 27, 162-7(1921).—Measurements have been made of the vapor pressures of NaCl , NaBr , NaI , KCl , KBr , KI , NaOH and KOH at

a number of temps. between the b. p. of the salts and 200–300° below the b. p. From the data obtained vapor pressure formulas have been adduced. H. J. C.

The use of enameled bombs in calorimetry. C. MATIGNON AND (Mlle.) G. MARCHAL. *Compt. rend.* 172, 921–22(1921).—The HNO_3 produced in the explosion attacks the enamel and is neutralized by it. The loss of acid may lead to an error of $\frac{1}{4}\%$. It is rendered negligible by first treating the enamel for some hours with dil. acid. W. P. WHITE

A determination, by means of a differential calorimeter, of the heat produced during the inversion of sucrose. HENRY H. DIXON AND NIGEL G. BALL. *Sci. Proc. Roy. Dublin Soc.* 16, 153–64(1920); cf. *C. A.* 14, 3812.—With an app. similar in character to that of Hill (*C. A.* 6, 1015), the differential calorimeter being formed by two vacuum flasks, and the temp. measurements being made with a thermo-elec. couple (cf. Dixon, *C. A.* 6, 1871), the authors have detd. the heat of inversion of sucrose by invertase. They obtain the value 3.83 cal. per g. mol., which is in close agreement with the value obtained by Brown and Pickering (*J. Chem. Soc.* 71, 783(1897)). Attempts to obtain a value for the heat of reaction during the hydrolysis of maltose were not successful. J. C. S.

The Peltier effect and low-temperature research. A. A. CAMPBELL SWINTON. *Nature* 106, 828(1921).—Attention is called to the possibilities of applying the Peltier effect as an aid in obtaining materially lower temps. than have yet been reached. OLIVER LODGE. *Ibid.* 107, 73(1921).—It is considered probable that at any temp. at which elec. resistance ceases the Peltier effect will cease also. GEOFFREY MARTIN. *Ibid.* 107, 43, 141.—The contrary view is advanced that the Peltier effect will probably not disappear at very low temps. as there is a continuous transition between metals and non-metals and this distinction between them does not vanish at very low temps. Consequently pairs of elements must always exist with electrothermic differences. W. H. ROSS

The fusion of potassium salts and mixtures of salts containing water of crystallization. I and II. E. JÄNECKE. *Kali* 10, 371–5(1916); 11, 10–13, 21–6(1917); *Neues Jahrb. Min. Geol.* 1920, i, Ref. 262–3, 263–5; cf. *C. A.* 10, 143.—I. The sepn. of the melt and residue in the incongruent fusion of K salts and mixts. with other salts was effected in a special app. under pressure. A diminution of pressure was observed at the m. p. Gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, exhibits incongruent fusion at 123–30°, the soln. pressed out being very dil. and the residue having the compn. $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$. The hydrate, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, is in equil. at 51° with a melt of given compn. and the hydrate, $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$, which may be sepd. by pressing. The hexahydrate shows an anomaly in its incongruent fusion, since the equil. at 68° between this salt, kieserite, and melt can readily be superheated. The pressed residue contains so much mother liquor as to lead to the suspicion of the formation of an intermediate hydrate. The displacement of the incongruent m. p. by pressure is also possible. II. The behavior of other salt pairs in the pressure app. was studied, including the fusion of kainite, of a mixt. of kainite and carnallite, and the transition of a mixt. of reichardtite, sylvine, and carnallite into kainite and melt. The incongruent fusion of kainite occurs theoretically at 85°; in many cases 155–65° was reached under pressure; the transition temp. of kainite and carnallite may also be much above the theoretical value according to the conditions. By very slow heating the theoretical values are found. In the formation of the Stassfurt deposits the melts formed by incongruent fusion may have been pressed out and thus the reverse changes prevented. The influence of pressure may also have been present. J. C. S.

Thermal and crystallographic investigation of the ternary systems lithium chloride-sodium chloride-potassium chloride and calcium chloride-strontium chloride-barium chloride. WALTER SCHAEFER. *Neues Jahrb. Min. Geol., Beil. Bd.* 43, 132–89(1919).—

The m. ps. of the pure substances were redetd.: LiCl, 609°; NaCl, 802°; KCl, 774°; CaCl₂, 773°; SnCl₂, 870°; BaCl₂, 960°. I. *The system LiCl-NaCl-KCl.*—Li and K chloride form neither compds. nor mixed crystals; the eutectic point is at 361° with 58 mols. % KCl. Li and Na chlorides form a continuous series of mixed crystals, the m. p. minimum being 552° with 72 mols. % LiCl. Na and K chlorides are also completely miscible, the m. p. minimum being 661° with 50 mols. % NaCl. In both these cases miscibility is incomplete at lower temps.; in the first case the limiting miscibility curve has a max. at 271° with 58 mols. % LiCl, and in the second case 402° with 50 mols. % NaCl. Above these maxima miscibility is complete. The ternary triangular diagram is bounded on two sides (LiCl-NaCl and NaCl-KCl) by narrow areas of complete miscibility, the remainder of the diagram being an area of incomplete miscibility, with a eutectic point at the concn. LiCl, 51.5 mols. %; NaCl, 11.5 mols. %; KCl, 37 mols. %. II. *The system CaCl₂-SrCl₂-BaCl₂.*—Ca and Ba chlorides form a double salt, CaCl₂·BaCl₂, which is immiscible in the cryst. state with its components. There is a eutectic point at 602° with 38 mols. % BaCl₂. Ca and Sr chlorides form a continuous series of mixed crystals with a minimum at 86 mols. % CaCl₂. At lower temps. sepn. takes place, the max. temp. on the limiting miscibility curve being 543°. Ba and Sr chlorides are also completely miscible, but on account of the dimorphism of BaCl₂, the regular β -mixed crystals first sepg. change into a doubly refracting α -form. The course of the transition curve was detd. The ternary diagram is divided into areas of complete and incomplete miscibility by a limiting curve. In the area of incomplete miscibility is a ternary eutectic point where the double salt CaCl₂·BaCl₂ is in equil. with two ternary mixed crystal phases, rich in BaCl₂ and CaCl₂ resp. The ternary mixed crystals sepg. in the area of complete miscibility are dimorphous, and the transition surface for these mixed crystals was detd. in the same way as the transition curve for the Ba-Sr chloride mixed crystals. In the ternary area the existence of the binary compd. CaCl₂·BaCl₂ crystallizing at 631°, and of a ternary compd., CaCl₂·SrCl₂·BaCl₂, crystallizing at about 500°, was established. These are the only compds. known among the chlorides of the alk. earths. J. C. S.

Ternary systems of potassium chloride, sodium chloride, and the chlorides of bivalent metals. KURT SCHOLICH. *Neues Jahrb. Min. Geol., Beil. Bd. 43*, 251-94 (1920). —The equil. conditions in the 3 ternary systems formed by Na and K chlorides with Ca, Sr, and Mg chloride resp. have been investigated. I. *The system CaCl₂-KCl-NaCl.*—The binary systems CaCl₂-KCl and CaCl₂-NaCl were investigated by Menge (C. A. 6, 44), who reported the existence of compds. KCl·CaCl₂ and 4NaCl·CaCl₂. Neither Lamplough (C. A. 5, 2769) nor S. confirms the existence of the NaCl compd. Na and Ca chlorides are practically immiscible and form a eutectic at 506° with 53 mols. % CaCl₂. The concn.-temp. prism of the ternary system consists of 3 satn. surfaces corresponding with the sepn. of CaCl₂, the double salt KCl·CaCl₂, and mixed crystals (K, Na)Cl resp. The double salt is immiscible with NaCl, and forms no compd. with it. Through the double salt, the ternary system is divided into two partial systems. In the first of these there is a eutectic point in which CaCl₂, NaCl, and double salt are in stable equil. In the second partial system, KCl·CaCl₂-NaCl-KCl, there is a limiting curve along which double salt and mixed crystals, (K, Na)Cl, are in equil. with the liquid phase. This curve reaches a minimum, where it is met by a curve crossing the mixed crystal surface from the minimum point of the binary NaCl-KCl system. II. *The system SrCl₂-KCl-NaCl.*—Two compds. are formed between SrCl₂ and CaCl₂. 2KCl·SrCl₂, E, and KCl·2SrCl₂, D. The first compd., E, forms long, rhombic prisms, and has the m. p. 567°; the second, D, has m. p. 638°, and is probably monoclinic. The compd. D forms with NaCl a binary eutectic system, by which the ternary system is divided into two partial systems. The ternary diagram is very similar to the previous one, with 4 surfaces instead of 3. III. *The system MgCl₂-KCl-NaCl.*—MgCl₂ and

KCl form only 1 compd., $\text{KCl} \cdot \text{MgCl}_2$, the existence of the other compd. reported by Menge (*loc. cit.*) not being confirmed. The compd. has m. p. 487° , and crystallizes in large prisms with weak double refraction. It forms with NaCl a binary eutectic system. NaCl and MgCl_2 form two compds., the first having the formula $\text{NaCl} \cdot \text{MgCl}_2$, and the second probably $2\text{NaCl} \cdot \text{MgCl}_2$, but the evidence for the latter is indirect. The ternary system is divided into two partial systems by the binary system $\text{KCl} \cdot \text{MgCl}_2$ -NaCl. In the first partial system, MgCl_2 -NaCl- $\text{KCl} \cdot \text{MgCl}_2$, are 5 surfaces, with 3 invariant points, two of which are transition points and the other a eutectic. The other partial system, $\text{KCl} \cdot \text{MgCl}_2$ -KCl-NaCl, is of interest in that the eutectic mixt. consists of the double salt $\text{KCl} \cdot \text{MgCl}_2$ and two limiting mixed crystal phases of NaCl and KCl. The temp. of sepn. of mixed crystals of Na and K chlorides is raised in presence of a third substance, through the formation of a ternary mixt. In the MgCl_2 ternary mixture the sepn. of the mixed crystals takes place before the end of the crystn. process, but in the other cases, in which it was not detected, probably only after solidification is complete. (Cf. VORRISCH AND JÄNECKE, *C. A.* 9, 895; 14, 671.) J. C. S.

Theory of electrolytic ions. XVII. Conductivity of sodium arsonates. RICHARD LORENZ AND ERIKA SCHMIDT. *Z. anorg. allgem. Chem.* 112, 209-20 (1920); cf. *C. A.* 15, 1438.—Conductivity data have been obtained for 22 Na salts of acids containing arsenic in the acid radical. Mol. conds. at infinite diln. are calcd. by means of the extrapolation formulas of Kohlrausch. In the case of certain dibasic acids it was not possible to calc. this quantity. C. R. PARK

Mechanism of energy change in the passage from the atomic to the ionic state. RENS AUDEBERT. *Compt. rend.* 172, 753-5 (1921).—The e. m. f. of an electrode is calcd. from a consideration of the heat of ionization and the work necessary to overcome the attractive forces between the atoms of the electrode. The concordance between the calcd. and observed values is fair. C. R. PARK

The theory of ions. H. VIGNERON. *Ann. chim. anal. chim. appl.* [2] 3, 4-15 (1921).—A brief outline of the theory of electrolytic dissociation and of some of the phenomena which it attempts to explain. JAMES M. BELL

A new method of measuring electrolytic conductance. CHARLES MARIE AND W. ALBERT NOYES, JR. *J. Am. Chem. Soc.* 43, 1095-8 (1921).—Two tubes with a capillary connection are each provided with a H electrode of spongy Pt, the Pt gauze being close to the end of the capillary tube. Direct current could be employed by previously regulating the H pressures until the e. m. f. was observed, and by allowing the current to pass only long enough to det. the direction of the deflection, the usual Wheatstone bridge method being used. Results by the direct current method and by the usual alternating current method accorded well for H_2SO_4 , HCl, oxalic acid, citric acid, succinic acid and NaCl, except for solns. over 0.5 N in H_2SO_4 and HCl. JAMES M. BELL

The conductivity of dilute alloys free from mixed crystals. K. LICHTENECKER. *Physik. Z.* 21, 352-4 (1920).—Burger has recently carried out expts. to det. the cond. of alloys free from mixed crystals (*C. A.* 14, 143). He limited these to dil. alloys in which the vol. of one of the two components was only a very small fraction of the total vol. With this limitation, Burger made an approximate calcn. for the cond. of a dil. alloy in which the lower component is sprinkled throughout the vol. in the form of small isolated particles of simple shape (spheres, rods, plates). The object of Burger's work was to find whether the shape of the boundary between the components of the alloy exerts an influence on the value of the sp. cond. Burger concluded that such was the case. The present paper is a criticism of this work, whereby L. establishes that Burger's formula leads to impossible values for the cond. in certain cases. Section A deals with the case of nonconducting material embedded in a conductor, and Section B with conducting material enclosed in a nonconducting medium. In case A for plates and in

B for plates and rods, impossible values are obtained with Burger's formula. Only in the case where the particles have spherical shape is the formula valid, and this problem has been already solved by Maxwell. The latter's work is then briefly described, and the paper concludes with a reference to the satisfactory results obtained on the assumption of a tesseral space-lattice arrangement.

E. J. C.

A method of photographically registering chemical reactions accompanied by a change in pressure. P. JOLIBOIS. *Compt. rend.* 172, 809-11(1921).—A Pt wire about 0.1 mm. in diam. and 50 cm. long is placed in one arm of a manometer. Change in the Hg height changes the length exposed and consequently causes a change in the elec. resistance. A Daniel cell is connected to the wire through a galvanometer. By photographically registering the change in galvanometer throw when current passes, a permanent record of such changes can be made.

E. H. DARBY

Bearing of a synthetic dye industry upon our national welfare (BOGERT) 25.

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD L. WENDT

Recent advances in science—Physical chemistry. W. E. GARNER. Univ. London. *Sci. Progress* 15, 541-4(1921).—Review of recent work on the radiation hypothesis, the cyanogen bands, and luminescence. Cf. *C. A.* 15, 1234. JOSEPH S. HEPBURN

Atomic structure. N. BOHR AND NORMAN R. CAMPBELL. *Nature* 107, 104-7, 170(1921).—Bohr, in a reply to Campbell, directs attention to the possibilities which the elaboration of the principles underlying the spectral applications of the quantum theory seems to open for the interpretation of other properties of the elements. The question will be treated more in detail in a later paper. MARIE FARNSWORTH

Atomic nuclei. E. GEHRCKE. *Physik. Z.* 22, 150-2(1921); cf. *C. A.* 14, 1925.—In the C nucleus, the 6 electrons and 6 of the H particles are now arranged alternately in a 12-membered ring with 6 more H particles just outside the 6 electrons. No dynamical considerations are introduced, but similar pictures of other nuclei are drawn and among other things "the 5 Cl isotopes found by Aston" are thus explained. G. thinks that Rutherford's disintegration expts. are better accounted for by the present arrangements than by previous ones. NORRIS F. HALL

The evolution of the elements and the structure of atomic nuclei. EMIL KOHLWEILER. *Physik. Z.* 22, 243-6(1921); cf. *C. A.* 14, 2747, 3188.—K.'s earlier theories of the compn. of nuclei are somewhat modified in this paper in view of the recent work of Rutherford and Aston. A table is given showing the predictions of the modified theory for light elements. [This includes Be 10 and (11?) not found by Thompson.—ABSTR.] A second table shows the calcd. and detd. at. wts. of a selection of individual isotopes and elements. Certain isotopes of B, S, and P, hitherto found missing, are nevertheless believed to exist as well as a heavier isotope than Ca 40. Cr is probably a "pure" element. NORRIS F. HALL

The structure of the helium atom. IRVING LANGMUIR. *Phys. Rev.* 17, 339-53 (1921); cf. *C. A.* 14, 2580.—Beside the semi-circular model of the He atom developed in the paper referred to, L. here develops a double circle model in which the 2 electrons move in 2 separate, parallel, circular orbits. This model, however, is unstable, and the ionizing potential, computed by applying the quantum theory, comes out negative. Moreover, the magnetic moment is not zero. The behavior of the semi-circular model is analyzed in greater detail than in the preceding paper. In the case of coupled electrons the quantum theory should be applied not to the momentum of the individual electrons according to the relation $\int p dq = h/2\pi$ but rather to the momentum which, by being relayed from one electron to another, passes in each direction around the nucleus. NORRIS F. HALL

The structure of the static atom. IRVING LANGMUIR. *Science* 53, 290-3 (1921).—Mathematical. Stability is obtained by the assumption of a repulsive force

$Fq = \left(\frac{nh}{2\pi}\right)^2 \left[\frac{(1/m) + (1/M)}{r^3}\right]$ between an electron of charge e and mass m , and a nucleus of charge Ze and mass M , where n is an integer denoting the quantum state of

the electron. The important consequences of Bohr's theory all follow from this one also, and the present theory is much simpler when applied to polyelectronic arrangements.

NORRIS F. HALL

The general system of the isotopes. A. VAN DEN BROEK. *Physik. Z.* **22**, 164-70 (1921); cf. *C. A.* **14**, 3574.—At least 2 fundamental conditions must be fulfilled in the construction of an isotope-system: (1) As is generally assumed, the number of H nuclei combined with the He nuclei and electrons must be very small. (2) The introduction of nuclear electrons must follow definite rules. Further: (1) the number of fundamental particles must be detd.; (2) the development of series from these fundamental particles must be restricted by a rule for the introduction of β -particles. Definite assumptions covering all these points are made, and a general table of isotopes predicted on this basis is given. An interpretation of the lengths of the periods in the periodic table on the basis of B.'s theory of general atomic disintegration closes the paper.

NORRIS F. HALL

The atomic weight of the chlorine in certain minerals. (MLLE.) IRÈNE CURIE. *Compt. rend.* **172**, 1025-8(1921).—A known wt. of AgNO_3 (powdered and dried at 50°) was dissolved and added to an excess of chloride soln., acidified with HNO_3 . The AgCl was filtered off and weighed. Three Cl minerals were examd.: a Canadian sodalite, a Norwegian chlor-apatite, and a sample of NaCl from a Central African desert, apparently formed by the natural weathering of local Archaean granites. A control expt. was made each time with "ordinary" chloride soln. No difference greater than 0.02 units of at. wt. was found for the first 2 minerals, and this is within the exptl. error. The Cl from Africa gave a value of 35.60 for the at. wt. if ordinary Cl = 35.46. This is the result of only a single detn., and will be repeated. Br and I, which might have caused the difference, were not found.

N. F. HALL

The nomenclature of the radioactive families. M. C. NEUBURGER. *Physik. Z.* **22**, 247-8(1921).—Exptl. radiochemists are invited to discuss the following scheme: "principal," "trunk-," and "branch-"families (Haupt-, Stamm-, and Zweig-familien) are distinguished. The whole U and Th families, including branch series, are the principal families. The trunk family of U changes at U_{11} into the Act and Ra branch families. The former of these should be called the "U-Act family" as the latter is now called the "U-Ra family."

NORRIS F. HALL

Rutherford's work on the collision of α -particles with light atoms. W. RIHL. *Z. tech. Physik* **1**, 159-65(1920); *Science Abstracts* **24A**, 116.—This contribution is mainly a summary of Rutherford's recent work as set forth in four papers by him in 1919 (*C. A.* **13**, 2480).

E. J. C.

Peculiar effects produced by α -ray bombardment. E. MÜHLESTEIN. *Arch. sci. phys. nat.* **2**, 423-4(1920); *Science Abstracts* **24A**, 112.—In the course of a series of expts. on the photographic effects produced by α -rays, M. has observed curious deformations in the photographic layer. As a source of α -rays, small Cu plates coated with a very active layer of Pol were employed, these discs being placed perpendicular to the photographic film. In the immediate neighborhood of the small active surface, in the region of most intense bombardment, there appears on the plate (developed, fixed, and dried) a depression resembling the imprint of finger nails: the hollow, forming an oval arc, having a depth nearly half the thickness of the film. Attempts to explain the formation of this depression on the grounds of chem. decompn. of Ag gelatin-bromide by the bombardment of α -particles were unsatisfactory, only a small fraction of the effect being traced to this cause. It appeared, therefore, that the depressions might be due to some direct action of the α -rays on the gelatin. Expts. on pure gelatin films soon verified this, the depressions being quite well marked as before. For example, with a gelatin layer 46μ thick the depth of the depression after bombardment, subsequent soaking in water and drying, was about 22μ , nearly half the thickness of the gelatin layer. The effect

is not directly mechanical, since the depression is not observed before the film is soaked in water. After water treatment and subsequent drying, however, the depression remains permanent. M. suggests that the effect may be due to some change in the mol. structure of the gelatin, but he reserves a decision until further expts. have been made.

Ratio of U Y and U X. A. PICCARD AND E. STAHEL. *Arch. sci. phys. nat.* **2**, 263-5 (1920); *Science Abstracts* **23A**, 508.—Paper read before the Soc. Suisse d. Physique. Describes a re-detn. of this ratio. A value of approx. 8%, or more roughly $1/12$, is now given as trustworthy.

E. J. C.

Explanation of the number of dispersion electrons by the quantum theory. R. LADENBURG. *Z. Physik* **4**, 451-68(1921).—L. shows by statistical methods that the number of dispersion electrons, as obtained by measurements of emission, absorption, anomalous dispersion and magneto-rotation, must be equal to $N_i a_{ki} (g_k/g_i) (mc^3/8\pi^2 e^2 \nu_{ki})$, where N_i is the number of atoms in the state i (Bohr atom), a_{ki} the probability of the spontaneous transition of k to i , ν_{ki} the frequency, and g_i and g_k the statistical "weights" of the states i and k . The approximate agreement of this number, R , for the first term of the alkali principal series with the at. number means that the mean life of the atom in the excited state is $3mc^3/8\pi^2 e^2 \nu^2$, which is what the classical theory would give for a resonator of this frequency. The fact that for the D-lines of Na, $R_{D_2}/R_{D_1} = 2$ means, on the assumption of the same mean life in the excited state, that the state $2p_2$ is twice as probable as $2p_1$.

F. C. HOYT

Theory of probability in electron emission. E. SCHRÖDINGER. *Sitzb. Akad. Wiss., Wien* **128**, 2a, 177-237(1919); *Science Abstracts* **23A**, 584.—A discussion of the problems in probability arising in the theory of discontinuity in electron emission advanced by E. v. Schweidler (see *Science Abstracts* **13A**, No. 1, 458(1910)).

E. J. C.

The experiments of Theodorides and Kopp and the magneton. P. WEISS. *Arch. sci. phys. nat.* **2**, 417-8(1920); *Science Abstracts* **24A**, 144.—Paper read before the Soc. Suisse de Physique. Honda and his collaborators concluded from their research on solid salts that the calcd. at. moments were not in agreement with the theory of the magneton, while Cabrera came to the opposite conclusion. Theodorides has tested a number of salts and finds that the linear variation of the reciprocal of the coeff. of magnetization with temp. is verified with great exactness as required by the theory of the mol. field. His results are therefore in accord with the theory of the magneton. When the at. moment is feeble, the diamagnetism underlying the atom is no longer negligible, and has to be taken into account if the linear law is to be maintained. Kopp has sepd. the paramagnetism from the diamagnetism in the same atom and has detd. each of these, finding for Pt 7.93 magnetons and for Pd 8.03 magnetons, their coeffs. of diamagnetic magnetization being -0.14×10^{-6} and -0.54×10^{-6} respectively. It is inferred that if Pt has 8 magnetons for the temp. range 15 to 400°, this metal contains exactly 9 magnetons for the range 640 to 1000°.

E. J. C.

The electron tube as a large variable resistance. PETER LERTES. *Z. Physik* **4**, 472-3(1921).—A 3-element vacuum tube with variable grid potential acts as a high resistance which is free from polarization and capacity or inductance effects.

F. C. HOYT

Evolution of heat at the anode of a discharge tube. I. PETERS. *Z. Physik* **4**, 432-6(1921).—P. measures the heat developed in a Cu sphere serving as the anode in a discharge tube excited by a d. c. potential. Measurements were made at the same time of the potential gradient along the tube. The results show that all of the heat evolved can be attributed to the energy imparted to the electrons (a) in the case of an unstratified positive column without dark space by their passage through the anode drop, (b) in the case of stratified or unstratified column with dark space by their passage through the anode drop and the anode dark space, and (c) in the absence of a positive column by their passage from the beginning of the Faraday space.

F. C. H.

Phenomena of electrolytic luminescence shown by certain metallic anodes. 1. JAMES LAVAUX. *Compt. rend.* 169, 180-2(1919).—Certain metals capable of giving, with the electrolytic anion, insol. adherent salts, which are nonconductors, show luminous phenomena correlative with a state of intense anodic polarization. Of the metals studied, Fe, Cu, Cd, and Pb do not show any luminous phenomena and show no tendency to anodic polarization. On the other hand, Al, Mg, Zn, and Bi show both. The luminous phenomena may be of two types, namely, phosphorescence and sparking. The first three metals show both types, but Bi only shows sparking. The phenomena of electrolytic phosphorescence only appear in very short elec. fields of high intensity, and are connected with high polarization of the anode and the creation at its surface of an intense elec. field. The phosphorescence is not accompanied by noise or sparking, and only occasions a minute expenditure of current and a very feeble development of heat. On the other hand, the sparking appears to characterize an abnormal working of the app. It occurs in two forms: (1) more or less numerous, small, brilliant sparks; (2) a rain of fire giving the anode the appearance of a star-spangled sky in a state of continuous transformation. The sparking is due to the momentary rupture of the isolating layer at points where, for a few moments, a current sufficiently intense to volatilize a liquid film passes, whence interruption, sparking, and crepitation. Of the 4 metals exhibiting these phenomena, Al is the best for their study. J. C. S.

Excitation of light by cathode rays in air. GORDON S. FULCHER. *Astrophys. J.* 52, 278-85(1921).—An attempt was made to study the distribution of light in discharge tubes. Cathode rays after passing through a hole in the anode rendered N gas luminous. The intensity of the N bands was detd., a spectrograph and a spectrophotometer being used. The greater the energy of the cathode rays the less was the intensity of light, at least within the range 1500 to 3000 v. This is contrary to the results obtained with canal rays. It is suggested that the intensity of light per ionizing collision may be found to be independent of the speed of the cathode ray. FARRINGTON DANIELS

Luminescence in inorganic substances. J. F. CORRIGAN. *Chem. News* 122, 133-6(1921).—C. gives a survey of the facts and classifications of luminescence phenomena and reviews explanatory theories. The treatment is along generally accepted lines. A few suggestions for exptl. investigation are given. FARRINGTON DANIELS

X-rays and their industrial application. G. W. C. KAYE. *Electrician* 86, 517-20(1921); *Engineering* 111, 412-5(1921).—A review, profusely illustrated. C. G. F.

Cohesion forces in the diamond. A. LANDÉ. Frankfurt a. M. *Z. Physik* 4, 410-23(1921).—L. calc. the electrostatic potential of the Bragg diamond lattice, and its heat of sublimation. This is on the assumption of Landé's type of C atom (*C. A.* 14, 3571) with 2-quantum elliptic electron orbits and a definite relation between the phases of the electrons in the orbits of different atoms. This gives for the heat of sublimation 262 kg. cal./mol. and for the lattice const. 1.65×10^{-8} cm. The corresponding empirical values are 168 kg. cal./mol. and 1.54×10^{-8} cm. If a lattice potential of the form $-(A/r^n) + (B/r^m)$, is assumed, best agreement with empirical values is obtained with $n=1$ and $m=9$, as for heteropolar compds., from which L. concludes that the assumption of this type of potential is not admissible. F. C. HOVR

Removal of electrons from metals under the action of high field strengths. G. HOFFMANN. Königsberg. *Z. Physik* 4, 363-82(1921).—H. shows that with field strengths of about 10^8 v./cm. between metal surfaces less than 1μ apart there is a slight conduction current which first becomes appreciable at a certain critical field strength. F. C. HOVR

Rotation of liquid dielectrics in a revolving electric field. PRYER LERTES. Frankfurt a. M. *Z. Physik* 4, 315-36(1921).—According to Debye's (*C. A.* 6, 1087) and Born's (*C. A.* 14, 2113) theories of electrolytic conduction a liquid dielectric contains free elec. dipoles. These dipoles would cause a turning moment on the liquid in a ro-

tating elec. field owing to friction between them and the surrounding liquid. Born has shown that this would only be appreciable at high frequency of rotation. At low frequencies the effect is masked by the turning moment owing to cond. and polarization of the liquid. Lampa (*Sitz. Akad. Wiss. Wien. Abt. IIa*, 115, 1659(1906)) has derived a formula for this latter effect in terms of frequency, cond. and dielec. const. *L.* measures the turning moment on small glass-inclosed spheres of several org. liquids suspended in a rotating elec. field. The results are in agreement with Lampa's formula, showing a max. with frequency, for a frequency range of 3.76×10^4 to 1.88×10^7 sec.⁻¹. For lower frequencies the discrepancies are very large, and are probably due to hysteresis effects in the glass. To det. directly the effect of Born's dipoles would require a higher frequency of rotation of the elec. field than is at present practicable. F. C. HOYT

The influence of light on the heat conductivity of selenium. BIANCA NANNI. *Nuovo cimento* [6] 20, 185-200(1920).—The heat cond. of Se discs was measured in the darkness and exposed to light (200 c.p.); it increases if the Se is exposed to light, especially at low temp., 0-20°, whereas this effect disappears at higher temp. But light has much less influence on the heat cond. than on the elec. cond. The cond. was detd. by 3 different methods, measuring the temp. of the heating system at thermal equil. Only the relative value was detd. EUGENE FIERTZ

The change of the spectrum of electric sparks with the time. G. POLVANI. *Nuovo cimento* [6] 20, 119-84(1920).—For these expts. P. used the following arrangement. With a concave rotating mirror the light from the elec. sparks was projected to the spectroscope; the speed of scintillation was regulated and related to the rotation of the mirror by initiating the elec. current to the electrodes in an auxiliary gap with ultra-violet rays making use of the Hertz photoelec. effect; the ultra-violet rays were obtained from an elec. arc between Fe electrodes. As electrodes were used Al, Ca, Pb, Ti, Bi, Mg, Zn, Cd, Zn-amalgam, Cd-amalgam, either both electrodes of the same metal, or a different metal for each. Time influences particularly the intensity of the lines of the spectrum. In general the intensity of "enhanced" lines varies periodically, but decreases gradually and disappears entirely in some cases. The intensity of weak lines increases in general. But no quant. measurements have been made. An observed difference of phase in the change of intensity P. believes to be due to the vaporization of the metal. The spectrum of single sparks was chiefly composed of lines of the electrode material, but the lines of the spectrum of the air dominated when the sparks followed each other very rapidly. The expts. confirm the belief that chiefly the negative electrode is active in the formation of the sparks. EUGENE FIERTZ

Anomalous dispersion of methyl violet, etc. J. E. VERSCHAFFELT AND R. CROMBERG. *Acad. Roy. Belge (Classe des Sciences) Bull.* 2, pp. 31-6(1920); *Nature* 105, 559-60(1920); *Science Abstracts* 24A, 26.—The authors divide a glass trough by means of a diagonal partition into two prismatic troughs, one of which is filled with the soln., the other with the solvent alone; the dispersion of the solvent is eliminated by this method of opposed prisms, as is shown, and the dispersion of the material is directly observed. The source of light was a Ca arc. The indices of refraction of 3 dyes detd. in this way are: methyl violet, solvents in two series alc. and water, wave-length 6712, 6497, 4455, 4227, index 2.52, 2.43, 1.23, 1.45; fuchsin, solvent alc., wave-length, 6712, 6497, 6170, 5857, 4227, index 2.21, 2.41, 2.63, 2.78, 1.19; *p*-nitrosodimethylaniline, solvent alc., wave-length 6497, 6170, 5857, 5603, 6270, index 1.74, 1.78, 1.81, 1.85, 1.93. In the first two cases the values found are in fairly satisfactory agreement with Pfüger's detns. of the indices of solid prisms of the dyes; in the third case the figures agree well with those of Wood, who used the same method (*Science Abstracts* 1899, 661), referring back to Sorlet. E. J. C.

The photochemical reaction between hydrogen and chlorine and its variation with the intensity of the light. E. C. BALY AND W. F. BARKER. *J. Chem. Soc.* 119, 653-64

(1921).—Einstein's law of photochem. reactions holds more rigidly for endothermic reactions. In the photochemical union of H and Cl, with const. intensity, the velocity of the reaction varies as the square of the Cl concn. It was found that the divergence from Einstein's law in this reaction increases rapidly with increase in the activity of the activating light. During the first moment of illumination the reaction must follow Einstein's law; reabsorption of radiated energy then causes the reaction velocity to increase to a max. When the light is cut off after the max. rate has been established, equil. is quickly reached. If it is again allowed to fall on the mixed gases the initial velocity will be faster than if no light had previously fallen upon it, and the same const. rate is reached in a much shorter time. There are, therefore, partly activated mols. present. Expansion of the Cl taking place in the absorption of light lying within its ultra-violet absorption band takes place here proportional to the rate of reaction. Thus divergence from Einstein's law is due to the reabsorption by the reactant mols. of energy radiated by the resultant mols. Also, frequencies characteristic of HCl are exact integral multiples of the fundamental frequency of Cl and evidence is strongly in favor of the exact integral relationship between them and the atomic frequencies of H, such a relationship being possible on the assumption of a fundamental unit of energy. Thus in the case of a photochemical reaction $A + B \rightarrow AB$ it should be possible to induce the reaction by means of a photocatalyst which absorbs light of a frequency not characteristic of either A or B and is not, therefore, absorbed by either A or B but which must contain the same elementary atoms as A and B.

H. W. POST

Photochemistry of alkyl iodides and iodine solutions. HANS STOBBE AND PAUL SCHMITT. *Z. wiss. Phot.* **20**, 57-92 (1920).—Alkyl iodides, either pure or in soln. in paraffins, light petroleum, benzene, toluene, CHCl_3 , Et_2O , CCl_4 , phenetole, acetic esters, or nitrobenzene, do not become colored when preserved in the dark for 2½ months. But in daylight a coloration is produced in a few hrs. in all cases. The coloration does not occur if O is absent. The action of ultra-violet light on solns. of EtI , in benzene or CCl_4 at -40 – -8° , and also in EtOH , has been studied. Solns. (6.25 N) of MeI , *n*-propyl iodide, and isopropyl iodide in benzene and EtOH have also been studied. It was also found that a soln. of I in benzene or CHCl_3 , after illumination for 20 hrs. with a quartz mercury lamp, on diln. gave a yellow soln., and not a red soln., as untreated I solns. do. To explain this action, the absorption spectrum of I, in alc., aq. alc., MeOH , propyl alc., isopropyl alc., and *sec*-butyl alc. solns. has been measured. Measurements were also made with alc. solns. of I to which org. iodides, ether, anisole, phenetole, and dimethylpyrone had been added. The expts. show that the decompn. of alkyl iodides with the liberation of I is an oxidation. Ethyl, methyl, and *n*-propyl iodides are similar in their behavior toward light, but isopropyl iodide is much less stable. Iodobenzene behaves similarly to the primary aliphatic iodides. EtBr is decomposed by ultra-violet light of short wave-length with the liberation of Br. Solns. of I in alcs. pass, in the course of time, into solns. of periodides (H tri-iodide or other additive compds.); this reaction is accelerated by light or spongy Pt. The absorption spectrum of true solns. of I consists of a single absorption band in the visible part of the spectrum, the position of which is independent of the nature of the solvent. The more the absorption is displaced toward the violet end of the spectrum the greater is the heat of soln. of I in the solvent. When such solns. are diluted with several vols. of benzene or CHCl_3 , the color immediately becomes red. The spectrum of the periodide solns. shows two absorption bands in the ultra-violet with frequencies 2800 and 3450, and on diln. with benzene or CHCl_3 , yellow solns. are obtained. During the change of I into the periodide, solns. of mixts. are formed which show 3 absorption bands. The spectra of I described by various observers indicate that from 5 to 100% of the I present had been converted into periodide. Dimethylpyrone iodide exhibits the same spectrum as the periodide.

J. C. S

Photochemical studies. XI. Photochemical equilibrium. I. PLOTNIKOV. *Z. wiss. Phot.* **20**, 93-122(1921).—A mathematical analysis of the reactions occurring in light and darkness, the kinetics of reversible reactions, and spurious equilibria.

L. DERR

Primary effect of light and photochemical valence. P. R. KÖGEL. *Phot. Kor.* **57**, 308-10(1920).—The primary endo-energetic effect is the release of a partial valence or of a part of the valence, made possible by the absorption of energy; the chem. effect leads to an addition product.

L. DERR

The energy exchange in photochemical processes in gases. E. WARBURG. *Phys. Techn. Reichsanstalt, Berlin. Z. Elektrochem.* **27**, 133-42(1921); cf. *C. A.* **9**, 883; **10**, 1299; **12**, 1727; **14**, 1930, 1931.—A number of exptl. details of W.'s earlier photochem. investigations are summarized. An improved method for photochem. ozonization is described. This method has been employed, using wave-lengths $\lambda = 0.207\mu$ and 0.253μ . Using the former wave-length the sp. photochem. action, φ (i. e., the chem. change produced by one g.-calorie of radiation absorbed), was found to have a mean value $1.514 \cdot 10^{-5}$, a value about 3.8% higher than that demanded by the photochem. equivalence law. It is pointed out that the agreement can probably be increased by a further improvement of the method and app. On the other hand, with $\lambda = 0.253\mu$, the value obtained for φ was less than that with $\lambda = 0.207\mu$, whereas the theor. value is $1.78 \cdot 10^{-5}$. This behavior is in agreement with previous results (cf. *C. A.* **9**, 883). Stern and Vollmer's paper on "the photochem. equivalence law from the viewpoint of the Bohr-Einstein conception of light absorption" (cf. *C. A.* **14**, 3588) is discussed in the light of W.'s ozonization results; and Bodenstein and Taylor's results (cf. *C. A.* **10**, 8012) on the rate of loss of activity of illuminated Cl are considered. In conclusion, relations between the chem. effects of radiation and of silent discharge on gases are discussed, and it is shown that O_2 is much more easily split than NH_3 , both by radiation and by the silent discharge. This is in accordance with the view already proposed, that the chem. action of the silent discharge is closely related to photochem. action.

H. JERMAIN CREIGHTON

Origin of spectra. *Engineering* **110**, 382-3(1920); *Science Abstracts* **23A**, 636-7.—Discussion before the British Assoc., Cardiff, Aug., 1920. A. FOWLER gave an account of some of the observations which theory had to explain. Different series of lines can be sorted out of the multitude of lines by their different elec., magnetic, and other properties, and formulas have been found for the various series by Balmer, Paschen, Ritz, Rydberg, Hicks, and others. Four chief series are now distinguished: the principal *P*, the diffuse *D*, and sharp *S* series, and the fundamental (Bergmann) series *F*. Combination series $2P-3S$, etc., are also recognized. The lines may be single (then marked *P*, *D*, *S*, *F*) or doublets or triplets (marked *p*, *d*, *s*, *f*). All the series are inter-related, *S* more to *P*, *F* more to *D*. The sepn. in doublets is const. in the *D* and *S*, but decreasing in the *P* and *F* series as the limit in the ultra-violet is approached, where all the lines become crowded. For the same group of elements the sepn. between the components of a doublet is proportional to the square of the at. wt., and hence increases, e. g., in the order Mg, Ca, Ba, Sr. The satellites further complicate spectra; in the series of Ca the triplet is well defined; in the *D* series the chief member is slightly shifted, the satellite occupying the normal position. In the enhanced lines of spark spectra some new lines appeared intensified while others dropped out. To account for these Bohr had replaced Rydberg's const. *N* by $N_1 = 2^*N$, and we might have to go further and introduce $N_2 = 3^*N$, the multiples of *N* being connected with the multiple charges on the particles. Concluding, Fowler remarked that many spectra do not show any regularity so far; also none of the formulas is absolutely accurate except those for the Balmer series of H and the enhanced (Fowler) series of He. But the chief thing to explain is why the wave number always comes out as a difference of two terms, one of

which is the limit of the series (which generally appears as a term of another series) and the other is a function of N . J. W. NICHOLSON, dealing with the theory, said that the chief difficulty even with a theory like Bohr's was the lack of definiteness of the dimensions of the atom as regards the radii of the electron orbits. Bohr, moreover, could not explain the endless numbers of lines of Hicks and others, and the observations agree with ν where theory agrees with ν^2 . But Bohr's atom has accounted for many peculiarities in the spectra of H and He, and his ideas have been modified and generalized by Sommerfeld for non-circular orbits, thus explaining the fine-line spectra. Nicholson proceeded to show how Bohr had applied the quantum relation to spectra, and how he has explained the discrepancy which arises from the fact that a nucleus carrying several charges, in equil. with all its electrons, would not be in equil. when one of them was expelled, the whole then forming a system rotating about a common center. Paschen has shown that the satellites become more complex with increasing at. wt. which fact can be explained if the sum of three terms in the energy equation remains const. Epstein has accounted for the Stark-effect on the quantum theory, and Stark himself has verified some of Epstein's further conclusions. But we do not understand as yet why certain components fluctuate in intensity, and so far the mathematical difficulties of "quantizing" the spectrum are too great. W. H. BRAGG considered the hypothesis (of Kossel and Lewis) of regarding the electrons as grouped in stationary positions as being more acceptable to chemists, and as fruitful as Bohr's theory, and he indicated the bearing of this hypothesis on spectroscopy. A. E. OXLEY referred to the magnetic properties of H and He. The H atom should be paramagnetic, and Hatfield had found that Mn fused in a H atm. was paramagnetic. But the H mol., which on Bohr's theory might be represented as consisting of two nuclei with two electrons rotating in a vertical plane between the two, should also be paramagnetic, while Onnes found liquid H diamagnetic. It was similar with He. Bohr's model could not be accepted, while Bragg's theory accounted for the magnetic properties and also for the ν instead of ν^2 . Nicholson replied to this objection that the orbit of the H electrons need not be circular; the electrons might oscillate up and down in a line or describe contracted paths. E. J. C.

Intensity distribution in line spectra. R. SEELIGER. *Z. Physik* 4, 424-32 (1921).—A general discussion, largely critical of the work of Frank and Hertz (*C. A.* 13, 2483).

F. C. HOYT

Spectrophotometry of flame arcs. I. G. PRIEST, W. F. MEGGERS, K. S. GIBSON, E. P. T. TYNDALL, AND H. J. McNICHOLAS. *Bur. Standards, Tech. Papers* 168, 14 pp. (1920); *Science Abstracts* 24A, 106.—This amplifies, with a diagram of the apparatus, the description previously given of this work [Priest, *et al.*, *Phys. Rev.* 14, 184-7 (1919)]. The paper also contains photographs of emission spectra of the Speer, Columbia, and Electra carbons burnt in the Sperry arc lamp. E. J. C.

Ultra-violet absorption spectrum of benzene vapor. KARL SCHULZ. *Z. wiss. Photochem.* 20, 1-35 (1920).—The ultra-violet absorption spectrum of benzene vapor has been measured, using a concave grating, 6.47 m. radius of curvature and ruled with 15,450 lines per inch. The iron arc was used as source of light, and the first-order spectrum was photographed. Seventy-five bands were measured with an accuracy of 0.01-0.1 Å.U. The values are tabulated and compared with those of Witte (*C. A.* 10, 311). The structure of the spectrum is considered, and it is shown that a difference of 92.1 exists between the members of the long series. J. C. S.

The relation of the two D-lines of sodium vapor. R. LADENBURG. *Z. Physik* 4, 469-71 (1921).—From a brief consideration of the exptl. data L. comes to the conclusion that the ratio of the intensities of these 2 lines is 2.0. F. C. HOYT

Search for a new atmospheric gas (BOREL, JAQUEROD) 2. Composition, ionization and viscosity of the atmosphere at great heights (CHAPMAN, MILNE) 2.

BORNSTEIN, R.: Sichtbare und unsichtbare Strahlen. Leipzig u. Berlin: B. G. Teubner. 130 pp. M 8.60. For review see *Jahrb. Radioakt. Elektronik* 17, 91(1920).

FAJANS, K.: Radioaktivität und die neueste Entwicklung der Lehre von den chemischen Elementen. Braunschweig: Fr. Vieweg und Sohn. 124 pp. M 6.50 und Teuerungszuschlag. For review see *Z. Elektrochem.* 27, 285(1921).

LENARD, P.: Über Kathodenstrahlen. Berlin and Leipzig: W. de Gruyter and Co. 120 pp. M 15.

LIND, SAMUEL C.: Chemical Effects of Alpha Particles and Electrons. New York: The Chemical Catalog Co., Inc. 180 pp. \$3.00.

4—ELECTROCHEMISTRY

COLIN G. FINK

Edward Bennett Rosa. ANON. *Elec. World* 77, 1144(1921) illus.—An obituary.

C. G. F.

Power cost in the arc process (for nitrogen fixation). T. C. HAGEMANN. *Chem. Trade J.* 68, 170(1921).

E. J. C.

The electrochemical industries. JOHN A. SEEDE. *Gen. Elec. Rev.* 24, 522-7 (1921).—An illustrated review.

C. G. F.

Electrometallurgy in Peru. V. M. ARANA. *Ingeniero* 1, 127-33(1920).—A review.

C. G. F.

Muffled arc electric furnace for non-ferrous metals. ANON. *Iron Age* 107, 985-6; *Elec. Rev.* 78, 713(1921); *Elec. World* 77, 1322(1921).—Tests on a new type of elec. furnace developed by the Gen. Elec. Co. for melting non-ferrous metals shows a metal loss for yellow brass of less than 1.5% and for red brass less than 0.75%. The thermal efficiency is high and the expense for refractories and electrodes is reduced to a low value. There are two sizes, 50 lbs. (single-phase) and 1500 lbs. (3-phase); max. melting temp. is 1500°. The 1500-lb. furnace melts yellow brass, pouring at 1100°, with a power consumption not exceeding 270 kw.-hrs. per ton, operating 24 hrs. a day, with one heat every hr.; there are 3 vertical electrodes 5 in. in diam. Space in the muffle between each electrode and the wearing block, and the side of the muffle, is filled with crushed graphite to muffle the arc. The triangular space where the cross electrodes meet in the middle is filled with a mixt. of graphite and tar to insure a good elec. connection; the current flows from the vertical electrodes through arcs to the crushed graphite and the wearing blocks. The whole mass of graphite becomes incandescent, forming a heat source of large area and uniform temp. The atm. of the furnace is a reducing one. The temp. can be easily controlled.

O. A. HOUGEN

Electric furnace for high-speed steel. ANON. *Iron Age* 107, 691-2(1921).—The *Newhirk* type of elec. furnace is designed particularly for the melting of high-speed steels. This furnace is of the type having a bottom electrode covered with a refractory lining. It has three 6-inch graphite electrodes entering through the roof and a bottom electrode consisting of a Cu plate 3 ft. \times 2 $\frac{1}{2}$ ft. Upon the Cu plate is rammed hot C and tar. A 9-in. brick lining is laid on top of this—the bricks being separated by thin sheets of metal making contact with the carbon lining. The advantages of the bottom electrode are in maintaining a uniform current density, thereby preventing localized overheating, and in balancing the current in the three upper electrodes. The furnace is of 2-ton capacity, utilizing 450 kv.a. at 100 v. for melting and 60 v. for refining.

O. A. HOUGEN

Electric melting in non-ferrous industry. EDWIN F. CONE. *Iron Age* 107, 770-2 (1921); cf. *C. A.* 14, 2298.—A detailed summary of all types of elec. furnaces installed or contracted for in the non-ferrous industry in the U. S. On Mar. 1, 1921 there were

408 such furnaces as against 261 in 1920. This represents an increase of 56% in one year.

O. A. HOUGHN

Recent progress in high-frequency inductive heating. E. F. NORTHRUP. *Trans. Am. Electrochem. Soc.* 39, preprint (1921); *Chem. Met. Eng.* 24, 1097-1100(1921).—High-frequency converter sets rated under 25 kw. are designed for operation on a single-phase circuit, or on one leg of a polyphase circuit. A 60-kw. set is designed for operation on a 3-phase circuit. These high-frequency converter sets embody 3 essential parts: an oil-cooled transformer, constructed with internal reactance, a set of static condensers, and a metal discharge gap. The number of condenser units employed is about proportional to the kilowatt rating of the set. Little is gained in operating directly off high-tension supply lines. The 20-kw. high-temp. furnace consists of an inductor coil of 42 turns of 1 cm. flattened Cu tubing. The inductor is wound as a solenoid, 23 cm. long and 10.5 cm. in inside diam. The high-frequency potential is applied to the terminals of this solenoid and also cooling water. 2.5 kg. of electrolytic Fe can readily be melted absolutely C-free. The temp. is high enough to melt Pt and Mo. Amorphous C can easily be graphitized in this furnace. For melting in vacuum, a quartz tube closed at the bottom is used which just fits the coil. The large "electric crucible" will melt and pour brass and bronze in 90-kg. lots. The "mint type" furnaces are cylindrical and stationary, designed for melting metals in a crucible. The crucible is lifted out for pouring. The 4 furnaces of this type installed at the U. S. Mint use a total of 48 kw. N. has developed a new *refractory coating* for C and graphite crucibles which protects them against rapid oxidation when at high heat. This coating is built up as follows: First, over the C surface, a thin layer of alundum; then over this a layer of carborundum with a little silica, then introducing a core composed of 1 part of Acheson graphite to 3.5 parts of carborundum sand, packed in hard, then baking the crucible at 2050°. Al_2O_3 will wet graphite at this temp. The coating withstands a temp. of 2000°, is impervious to air at this temp., adheres tenaciously to the underlying C, and other coatings, such as MgO , may easily be laid over it and cling tightly. A 60-kw. tilting and pouring furnace of 600 lbs. capacity is in daily operation at Bridgeport, Conn. A detailed account of its installation and operation are given. In a single day's run this furnace melted 36558.49 oz. of Ag at an expenditure of 316.7 kw.-hrs.

C. G. F.

Electric furnace practice at Treadwell. W. E. CAHILL. *Mining Sci. Press* 122, 535-37(1921).—A description of the 2-ton Héroult elec. furnace installed at the Alaska Treadwell Mine. The original lining of "metalkase" magnesite brick proved too expensive, so standard SiO_2 brick was substituted except for two layers above the slag line. Considerable spalling of the roof takes place as the furnace is operating intermittently. The maximum life is about 185 heats. 12-in. amorphous C electrodes are used; they last about 20 heats. Power is stepped down from 2200 to 100 v. a. c. 60 cycle is used. With coke at \$50 per T. the cost of producing Fe in the elec. furnace is less than by melting in a cupola with coke. The Fe is melted under a neutral or reducing atm., and the metal refined under a CaC_2 slag, which removes the S even to the limits of that found in steel. The Si is not appreciably reduced and the addition of pig Fe is not required. The whole operation is under perfect control. The charge or any part may be withdrawn at the top, and little hearth repairing is needed. The final product is free from occluded gases. Details are given of difficulties encountered and methods of overcoming them. The metal is "finished" in the furnace, nearly complete de-oxidation being practical.

A. H. HELLER

Theory of electrochemical chlorate and perchlorate formation. N. V. S. KNIBBS AND H. PALFREMAN. *Trans. Faraday Soc.* June, 1920 (advance proof).—Results are given of the measurement of the conds. of chlorate, chloride-chlorate, and chlorate-perchlorate solns., the velocity consts. of the reaction hypochlorite to chlorate, and the resistance and voltage in technical cells, the data on conds. and on the dy-

namics of the hypochlorite-chlorate reaction covering a wider range than any previously published. The generally accepted theory of chlorate formation of Foerster and Müller (*Z. Elektrochem.* 9, 171-85, 195-208(1903)) is reviewed, and the loss of efficiency in technical working is shown to be due mainly to discharge of hypochlorite ions. Regulated addition of HCl was found to be the most satisfactory method of maintaining HClO concn. Insol. impurities in the electrolyte increase the resistance of the soln. and, therefore, the cell voltage, reduce the current efficiency by facilitating the loss of HClO, and exert an erosive action on the electrodes, the last effect being of special importance when Pt anodes are used. The two theories of perchlorate formation advanced by Oechsli (*Z. Elektrochem.* 9, 807-28(1903)) and by Bennett and Mack (*C. A.* 10, 2327) are discussed, and neither is considered to be adequate. It is maintained that perchlorate formation is due to chlorate ion discharge, and a mechanism similar to that of persulfate formation is suggested. The factors in the current efficiency of technical perchlorate formation are discussed, and chloride formation is shown to take place during electrolysis and to be dependent upon the temp. J. S. C. I.

Electrolysis of solutions of sodium nitrite using a copper anode. F. H. JEFFERY. *Trans. Faraday Soc.* June, 1920 (advance proof); cf. *C. A.* 15, 27.—The reactions at the anode are stated to be: the formation of the complex anion $\text{Cu}(\text{NO}_2)_6$ from NO_2 ions and the Cu; the decompn. of this $\text{Cu}(\text{NO}_2)_6$ by the water present giving the basic nitrite, $\text{Cu}(\text{NO}_2)_2$, CuO , and HNO_2 ; the slow decompn. of the undissociated portion of the HNO_2 formed, giving HNO_2 and NO . Although the presence of HNO_2 in contact with the Cu anode must give rise to cupric ions if no current were passing, yet, for a current of 0.16 amp., the concn. of such cupric ions as were formed was never sufficient for the deposition of Cu on the cathode during electrolyses lasting several hours. The Cu reacted with the NO_2 ions to form the complex anion, the anode remaining thereby at a low value, rather than with the NO_2 ions, which would have had the effect of raising the anode voltage. The result described is analogous to that taking place during electrolysis with a Ag anode in a soln. contg. NO_2 and NO_3 ions. J. S. C. I.

New galvanic cells and storage batteries. PRADEL. *Elektrotech. Anzeiger* 1920, 70-72.—A dry cell, of which the positive system may be renewed, is constituted of the combination PbO_2 , dil. H_2SO_4 , Zn. The av. discharge e. m. f. is 2.3 volts. When the cell runs down the Zn plates are replaced by others, and are meanwhile recharged between two Pb electrodes in dil H_2SO_4 . Spent MnO_2 employed as depolarizer is revived by powdering, treating successively with solns. of salts which dissolve out salts of NH_4 and Zn, with superheated steam under high pressure, and with O_2 , HClO , or a halogen. Alternatively, oxidation may be effected electrolytically, the electrolyte employed containing HClO , HClO_2 , a hypochlorite, or salts such as MgCl_2 , which yield a soln. of a hypochlorite on being electrolyzed, or K manganate or permanganate, dichromate, etc. J. S. C. I.

Calculating battery sizes for locomotives. J. H. TRACY. *Elec. World* 77, 1417-9 (1921). C. G. F.

Cell tester for making voltage readings with one hand. FRED A. REIBERT. *Elec. World* 77, 1322(1921). C. G. F.

The electric strength of air under continuous potential and as influenced by temperature. J. B. WHITEHEAD AND F. W. LEE. *J. Am. Inst. Elec. Eng.* 10, 373-87(1921). —In expts. made to det. the influence of temp. on the corona-forming continuous potentials, observations were made on the sizes of wire (0.025, 0.0903, and 0.0933 cm. diam.) at several values of temp. from 5 to 70° and for each temp. at different pressure varying from atm. to 60.3 mm. Hg. Within the range studied the general law of corona, previously developed, was confirmed. The critical surface intensity at which corona started upon these wires is summarized in the relation $E = 39.84 + 10.36 \sqrt{\delta/d}$ for + corona and $E = 40.3 + 11.96 \sqrt{\delta/d}$ for — corona. The const. A in the positive and negative

corona relation is the same. Under the same conditions of pressure and temp. negative corona always occurred at a high value. Curves of positive and negative corona each form a sep. family of curves when observed at the same temp. with variable pressure upon the same wire. Under temp. and pressure conditions corresponding to those at which their data were taken results accord with Farwell and Brown. Results of the investigation are in accord with Townsend's theory of secondary ionization.

W. E. RUDER

Five-watt neon lamps for 220-volt circuits. J. S. DOW. *Illum. Eng.* (London) 14, 14(1921).—A brief note.

C. G. F.

Fresh-water rheostat handles 900 kw. at 4000 volts. D. J. LOCKE. *Elec. World* 77, 1428(1921), 1 illus.—Detailed account of a simple piece of app.

C. G. F.

Quantity production of insulating varnish (ANON.) 26. Metal spraying as used in the electrochemical industries (MEURER) 9.

STARLING, S. G.: *An Introduction to Technical Electricity*. London: Mac-Millan and Co. 181 pp. For review see *Am. J. Sci.* 2, 56(1921).

Galvanic batteries. H. E. SMITH. *Brit.* 160,821, Mar. 30, 1921. Lead oxide paste for storage-battery plates is rendered porous by the addition of animal hair or wool. The wool is first treated with milk of lime or a soln. of Na_2S to loosen the wool from the skin and to remove scales. The treated wool is then ground into short lengths varying from 1/64 to 1/4 in. which are mixed to the extent of about 10% by vol. with the dry lead oxide.

Electrolytic re-sharpening of files and rasps. S. T. JUDD. *Brit.* 161,611, Oct. 20, 1919. Files, rasps, and the like are re-sharpened by placing them in an electrolyte and applying a high-pressure current capable of giving a spark of length equal to the average length of the files, this length in inches being also equal to the number of minutes required for treatment. An induction coil may be used. A suitable electrolyte consists of 36 parts of H_2O , 3 of HNO_3 , and 5 of H_2SO_4 . The water and files are placed in the vat and the acids added after current has been started. Before treatment the files may be washed, wire-brushed, dipped in alkali, and dried. According to the provisional specification, they may be dipped in a mixt. of lacquer and methylated spirit.

5—PHOTOGRAPHY

LOUIS DERR

Influence of temperature on photographic processes. I. PLOTNIKOV. *Z. wiss. Phot.* 20, 125-39(1921).—This is a tabulation, with bibliography, of the results hitherto obtained for the temp. coeff. of various reactions; the original paper should be consulted for details. Most of the well known light-reactions have a temp. coeff. of about 1.03. A second group, among which are $\text{H}_2 + \text{Cl}_2$ and $\text{SO}_2 + \text{O}$, has a coeff. of about 1.20; a third group, involving the elements Cl, Br, and I, has a coeff. of 1.40. The temp. coeff. of photographic plates averages 1.05. The coeff. for the dark reaction ranges from 1.70 to 4.50.

L. DERR

Theory of development of the latent image. M. VOLMER. *Z. wiss. Phot.* 20, 189-98(1921).—The action is not the same upon the Ag-contg. and the Ag-free nuclei. The development process is not a mere phenomenon of supersatn., but a case of heterogeneous metallic catalysis, by which its similarity to the chem. deposition of metallic mirrors is shown.

L. DERR

Size and sensitiveness of the grains in photographic emulsions. T. SVEDBERG. *Z. wiss. Phot.* 20, 36-50(1920).—In considering the blackening-law of a photographic plate and the behavior of the individual grains contained in it, the view that the law is a consequence of the lack of uniformity of the photochem. light-field inside the film is negatived by the work of Lüppo-Cramer, Scheffer, and others, and by the author's own expts. with very thinly coated plates, for which the usual type of characteristic curve was obtained. The possibility that each grain obeys the law of the plate appears to be inadmissible, since the size of grain resulting by development appears to be dependent on the amt. of development and not on the exposure. In exptl. examn. of the two remaining possibilities, viz., that each class of grains of approx. equal sizes obeys its own law, or that only an emulsion with grains of varying sizes obeys the law, uniform thin coatings of very dil. emulsions were used; after exposure and development the plates were treated with a Ag solvent (acid KMnO_4 soln. or acid $\text{K}_2\text{Cr}_2\text{O}_7$ soln.) and photomicrographs of the resulting films taken. The grains for a definite area of each photograph were counted and assorted into 4 classes according to size. The grains counted in this way are of course those which are not developed, and the numbers and sizes of the developed grains have to be obtained by comparison with the same emulsion untreated. Tables and curves are given for one type of plate, showing the relationship between exposure and percentage of grains affected in the 4 size-classes, and between size of grain and the percentage number attacked; the curve for the former is similar to the usual characteristic curve and that for the latter to an exponential. Similar results are given for solarization exposures, for H_2O_2 effect and for ordinary chem. fog, and the results are all in general agreement with the view that the larger grains are the more sensitive.

J. S. C. I.

Experiments on the formation of photographic emulsions. P. KNOCH. *Phot. Rundschau* 57, 49-50(1921).—In ordinary emulsion-making, the Ag is instantaneously converted into AgBr on the addition of the soluble bromide, and ripening tends to agglomerate the AgBr into relatively coarse grains. With AgNO_3 and ethyl bromide, Ag_2O and ethyl bromide, and Ag_2O and Na monobromoacetate, in which formation of AgBr is retarded until the ripening process, only thin, slow emulsions were obtained. It is suggested that collodion may be a more suitable vehicle for such reagents than gelatin.

L. DERR

Utilization of old films. G. BONWITT. *Chem. Ztg.* 45, 412-3(1921).—The emulsion is best removed with boiling water; acids hasten the process, but damage the film base. The gelatin is treated with H_2SO_4 ; heating 15-30 min. causes complete pptn. of the AgBr. The gelatin of developed films is simply allowed to dry before sending to the refiner. The celluloid is available for varnishes. Motion-picture film, in order to preserve the base for recoating, must not be so strongly heated, and friction by rollers assists in removing the emulsion.

L. DERR

Electrochemical aspects of photographic development. S. E. SHEPPARD. *Trans. Am. Electrochem. Soc.* 39, preprint(1921).—S. reviews at length all important work by Lermontoff, Armstrong, Bancroft, Luther, et al. Before satisfactory absolute reduction potentials for organic reducing agents can be detd., we require detn. of: (1) the state in solution of the reducing agents, (2) nature, and to some extent, kinetics of the reaction in development, (3) Ag equivalent of the reducer in the working period of development. At present the measurements by elec. methods are entirely relative to the particular experimental conditions, and largely accidental. There appears a possibility of more satisfactory results by application of a. c. electrolysis to the system $\text{Ag} | \text{AgBr} : \text{KBr aq.} | \text{Developer Neutral salt Developer} : \text{KBr aq.} : \text{AgBr} |$ Ag and this is being investigated at the Eastman lab. S. together with F. A. Elliott and A. D. Duschak have determined the state in soln. of the reducing agents and their acidic function: The computed ionization constants are: K_1 and K_2 for *p*-aminophenol.

5.13×10^{-11} , 6.91×10^{-11} ; for elon, 6.45×10^{-11} , 8.55×10^{-12} ; for hydroquinone, 1.75×10^{-10} , 3.97×10^{-12} ; for pyrogallol, 1.55×10^{-9} , 8.13×10^{-12} . The titration curves for these four developers are shown.

C. G. F.

Negative (photographic) development in bright light. LÜPPO-CRAMER. *Phot. Ind.* 1920, 378-9; cf. *C. A.* 15, 808.—Bathing in an amidol (diaminophenol hydrochloride) soln., 0.02 to 0.05%, for about 1 min. reduces the sensitiveness of a photographic plate from 50 to 100 times and allows subsequent development in a bright yellow light. With most developers there is hardly any effect by this previous treatment; glycine, however, gives dichroic fog, and quinol, by reason of the presence of small quantities of the amidol, becomes an energetic instead of a slowly working developer. Triaminobenzene acts similarly to diaminophenol, but the diaminoresorcinols, triaminophenol, and triaminotoluene do not produce the same effect. The addition of sulfite or bisulfite to the amidol soln. reduces its desensitizing effect considerably. J. S. C. I.

A new field for desensitizers. H. LÜPPO-CRAMER. *Phot. Korr.* 58, 40-3(1921).—The author's discovery that photographic plates have their sensitiveness greatly reduced by bathing in phenosafranin has been applied to X-ray plates. Since the action on X-ray plates is very different from that of light on ordinary plates, a phenosafranin bath may be applied before exposure without loss of sensitiveness to X-ray action. The dye may be incorporated in the emulsion before coating, and the plates may be handled in bright yellow light.

L. DERR

Exhaustion tests on developers. W. F. ERMEN. *Brit. J. Phot.* 68, 64-5(1921).—Equally exposed bromide prints in quarter-plate size were developed one after another in 100 cc. of variously compounded developing baths, and the times of appearance of the image plotted against number of prints developed. As developers, metol, *p*-aminophenol, cresols and quinol were studied. In all cases the time of appearance of the image was much lengthened as the number of successive prints increased. Monomet and *p*-aminophenol developed the greatest number of prints before exhaustion of the bath. In general about 30 prints exhausted the developer.

L. DERR

Photography of palimpsests; fluorescence photography. R. KÖGEL. *Sitzb. kgl. preuss. Akad. Wiss.* 37, 974-8(1914); *Science Abstracts* 24A, 106-7.—Palimpsests are photographed in the ordinary way with the use of color-filters, and with the aid of ultra-violet light. The third method of K. makes use of fluorescence. Illuminated by the ultra-violet radiations ($334 \mu\mu$) of a quartz-Hg lamp, the parchment fluoresces, but the erased writing remains almost dark, though the old inks used sometimes contained S compds.; chem. alteration of the parchment, greasing, etc., generally does not weaken the contrasts. Thus fluorescence photography often brings out details not disclosed by the other methods and has much improved the exploration of old manuscripts. For technical particulars of the method K. refers to *Beihefte Zentr. f. Bibliothekswesen* 44, Leipzig 1914.

E. H.

6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

Silicon hydrides. IX. Reactions with alkali metal. ALFRED STOCK AND KARL SOMMER. Kaiser-Wilhelm-Inst. f. Chemie, Berlin-Dahlem. *Ber.* 54B, 524-31(1921); cf. *C. A.* 14, 2305.—The following observations were made in an attempt to apply the Wurtz synthesis to Si compds. All the expts. were carried out by the vacuum process previously described, which permits of entirely excluding air, moisture and fat. When about 20 cc. SiH_3Cl gas are brought into contact with K (distd. *in vacuo*) the surface of the K at once becomes blue and further action is prevented by the film which is formed; only after heating several hrs. up to 300° did a deep-seated reaction take place, resulting

in a complete decompn. of the Si hydride compds. Among the non-volatile products were Si, KH and KCl; the residual gas was pure H. In order to be able to work in the cold by having the gas continually in contact with fresh metal, recourse was had to the Na-K alloys and Na-Hg which are liquid at room temp. Sketches are given of the specially constructed vessels in which the reactions were carried out. When 53.3 cc. SiH_3Cl were allowed to stand, with frequent shaking with 6-mm. steel pellets, 1 month with K-Na (at. ratio, 2:1) there were formed 1.5 cc. H_2 , 32.8 cc. SiH_4 and only a very small amt. of substance (4.7 cc. in gaseous form) with a tension of 7.5 mm. at -95° (tension of Si_2H_6 , 7 mm.) and which therefore possibly contained Si_2H_6 , but it also contained much Cl (0.0092 g.) and with NaOH gave 10.9 cc. H_2 ; the solid products of the reaction were not investigated. From 34.4 cc. SiH_3Cl shaken 16 hrs. with Na-Hg (1 g. Na to 10 cc. Hg) were obtained 1.5 cc. H_2 and 21.5 cc. SiH_4 ; no Si_2H_6 was found, but that it had been formed transiently is indicated by the fact that 52.8 cc. SiH_3Cl similarly treated gave 2.0 cc. H_2 , 30.4 cc. SiH_4 and 0.9 cc. of a less volatile gas consisting of Si_2H_6 with a little SiH_4 ; it was Cl-free and with NaOH gave 6.4 vols. H_2 (calcd. for Si_2H_6 , 7 vols.). The assumption that the reaction proceeds according to the equation $2\text{SiH}_3\text{Cl} + 2\text{Na} = \text{Si}_2\text{H}_4 + 2\text{NaCl}$ and that the Si_2H_4 formed is at once decompd. by the Na was confirmed by an expt. in which 42.3 cc. Si_2H_4 were shaken 18 hrs. with Na-Hg, whereby were obtained 1.3 cc. H_2 , 5.35 cc. SiH_4 and 37.7 cc. unchanged Si_2H_4 ; the fact that so much Si_2H_4 remained unchanged indicates that in the nascent state (as formed from SiH_3Cl and Na) it reacts with the Na much more rapidly than in the mol. form. With K-Na the reaction is much more complete; after 1 month 44.6 cc. Si_2H_4 gave 2.6 cc. H_2 and 48.0 cc. SiH_4 and no Si_2H_6 remained unchanged. From 45.7 cc. Si_2H_6 allowed to stand 1 month with Na-Hg without shaking, the vessel being merely cautiously inclined from time to time, were obtained 1.0 cc. H_2 , 1.2 cc. SiH_4 and 44.8 cc. unchanged Si_2H_6 . The fact that some SiH_4 was found shows that the reaction cannot be ascribed to frictional electricity, a conclusion confirmed by the fact that Si_2H_6 shaken 60 hrs. with pure Hg does not undergo the slightest change. To compare the above reactions with those of the corresponding C compds., 45.7 cc. MeCl was shaken 3 days with Na-Hg, giving 25.1 cc. practically pure CH_4 , and 2.0 cc. C_2H_2 , while 46.7 cc. C_2H_2 was unchanged after 4 days' shaking with Na-Hg and 57.14 cc. C_2H_2 shaken 1 week at 40° with K-Na gave only 0.2 cc. H_2 and a trace of a gas containing C. The C_2H_2 used was prepd. from ZnEt_2 and H_2O and was fractionated *in vacuo* until perfectly homogeneous; the removal of a more volatile impurity (probably CH_4) presented great difficulties; its tension is somewhat lower than given by Burrell and Robertson (C. A. 9, 2350), e. g., 177 mm. instead of 192° at -112.0° . Finally, 22.9 cc. SiH_2Cl_2 shaken 16 hrs. with Na-Hg gives 2.2 cc. H_2 and 6.1 cc. SiH_4 and no unchanged SiH_2Cl_2 remains. The mechanism of these reactions is not yet clear. In the formation of SiH_4 from Si_2H_6 , the Na possibly replaces H and the nascent H then reduces a part of the Si_2H_6 to SiH_4 while the rest condenses to non-volatile substances.

CHAS. A. ROUILLER

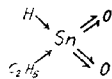
Trivalent manganese. II. JULIUS MEYER and ROBERT NERLICH. Z. anorg. allgem. Chem. 116, 117-36(1921); cf. C. A. 7, 2013.—In acid or neutral solus., Mn is not autoxidizable, only undissoc. $\text{Mn}(\text{OH})_2$ combining directly with atm. O_2 to form MnO_2 or its hydrates. Bivalent Mn in complex combination also takes up O_2 , giving $\text{Mn}(\text{OH})_2$ or, in a few cases, MnO_2 . Ten cc. of a MnCl_2 soln. containing 0.15 g. of Mn were shaken in a Knoop's azotometer with excess of air, with the addition of various reagents, until the O_2 absorption ceased, which often required several days. The calcd. absorption was 32 cc. O_2 for the formation of MnO_2 and 16 cc. for $\text{Mn}(\text{OH})_2$. The ppts. were filtered off, washed with excess $\text{C}_2\text{H}_2\text{O}_4$ and titrated back with KMnO_4 to det. the active O. The black ppts. formed when the O_2 absorption approached 32 cc. were MnO_2 , while the yellowish brown ppts. corresponding to an O absorption of 16 cc. were $\text{Mn}_2\text{O}_3 \cdot \text{H}_2\text{O}$. In the presence of 10 cc. of 10% NaOH, with 150 cc. of

H₂O, the above amt. of Mn absorbed 26–30 cc. O₂; with KOH, 27–30 cc.; with Ca(OH)₂ in suspension, 26–29 cc.; with Ba(OH)₂, 27.5–30.2 cc. According to the prevailing theory of autoxidation [Meyer, *J. prakt. Chem.* 72, 278(1905)] Mn(OH)₂ takes up a mol. of O₂ forming the moloxide H₂MnO₄ or H₂MnO₂(O₂), which is not identical with manganic acid. The moloxide easily gives up O₂ to an acceptor, such as Mn(OH)₂, forming finally only MnO₂ or its hydrates. Other compds. used as acceptors, Na₂SO₃ or Na₂AsO₃, were unaffected, the O absorption in their presence being the same as without them, with formation of MnO₂. With 10 cc. of 10% NH₃ diluted to 150 cc., and 1 g. of NH₄Cl, the O₂ absorbed was 14–15 cc., and the soln. changed to yellow, then brown, and deposited a yellowish brown ppt. of Mn(OH)₂, the complex mangano-ammonia cation being oxidized to mangani-ammonia cation, which is hydrolyzed. (NH₄)₂SO₃ and (NH₄)₂AsO₃ as acceptors were without effect. With 100 cc. of strong KCN soln. 14.6 cc. of O₂ were absorbed, the Mn(CN)₆⁴⁻ ion being oxidized to Mn(CN)₆³⁻, with subsequent hydrolysis to Mn(OH)₂. NaCN had the same action, 14–15 cc. of O₂ being taken up. No autoxidation occurred with KSCN. With excess of C₆H₅O₄, KOH and NaOH caused absorption of about 30 cc. of O₂, and gave black MnO₂, while with NH₄OH, 15 cc. of O₂ were taken up and brown Mn(OH)₂ was pptd. The same effects were obtained with C₂H₂O₄. In order to explain the different action of complex Mn ions containing C₆H₅O₄ and C₂H₂O₄, compared with other complex ions, it is assumed that in the former part of the Mn is present as Mn(OH)₂ in soln., which undergoes the usual oxidn. The reaction with NH₃ furnishes a convenient and rapid method for the prepn. of large amts. of Mn(OH)₂. MnCl₂ with an equal wt. of NH₄Cl is dissolved in H₂O to make a 5% soln., made alk. with concd. NH₃, and air passed in for 24 hrs. The ppt. is yellowish brown and granular, and cacao-brown after washing and drying, consisting of almost pure Mn(OH)₂ or MnO.OH. The product obtained by the hydrolysis of K₂Mn(CN)₆ with much H₂O is blackish brown, but on long heating with H₂O becomes yellow brown. By dropping acid solns. of MnCl₂, Mn₂(SO₄)₃, Mn₂(SeO₄)₃, MnPO₄, or MnF₃ into cold concd. NaOH, ppts. are obtained slightly darker than those formed by autoxidn. in NH₃, but becoming lighter on heating in H₂O. The ratio of Mn to active O was always 2:1. Hence the alk. hydrolysis of these salts is represented: Mn₂(SO₄)₃ + 6NaOH = 3Na₂SO₄ + 2Mn(OH)₂, and not by Mn₂(SO₄)₃ + 6NaOH = 3Na₂SO₄ + Mn(OH)₂ + MnO₂ + 2H₂O. According to the latter equation, the ppt. containing Mn(OH)₂ should be susceptible to further autoxidn., which is not the case. If the ppts. are treated with cold, concd. acids, the original salts are formed. A few drops of concd. MnCl₂ soln. in a large amt. of ice water give a pale red color, then blackish brown flocks, which show a ratio of Mn to active O of 1:1, and are MnO₂.H₂O. But only part of the Mn is pptd., the rest remaining in soln. as Mn³⁺. The filtrate, after making alk., gives a yellowish ppt. becoming dark in the air, hence Mn(OH)₂. The hydrolysis is therefore 2MnCl₂ + 6H₂O = MnO₂ + Mn(OH)₂ + 6HCl. In the azotometer, a hydrolyzed soln., nearly neutralized with alk., absorbed 22.8 cc. of O₂, and the Mn in the filtrate was detd. Half the Mn found corresponded to 23.6 cc. of active O. This striking difference between alk. and acid hydrolysis is only apparent, however, and due to a secondary reaction. An aq. suspension of Mn(OH)₂ obtained by autoxidn. is changed instantly to blackish brown by dil. H₂SO₄, and the effect is not reversible by alks. The splitting into manganous salt and MnO₂ is quant., equal amts. of each being formed. This point was confirmed by autoxidn. expts. Most other dil. acids have the same effect on Mn(OH)₂, but dil. HF dissolves Mn(OH)₂ completely, with a red color. Dil. HCN has a very slight solvent action. Dil. C₂H₂O₄ causes slow soln., with red color, changing to colorless. This action is attributed to the formation of complexes. Hence in both acid and alk. hydrolysis of manganic salts, the primary action is the formation of Mn(OH)₂, which is not further changed by alks., but is split by acids into manganous salts and MnO₂. Most concd. acids dissolve Mn(OH)₂ forming manganic salts, but concd. HNO₃ ppts.

all Mn as black MnO_2 . According to Sem (C. A. 9, 3183; 11, 2757) manganic salts do not contain trivalent Mn alone, but represent an equil. condition: $2\text{Mn}^{+++} \rightleftharpoons \text{Mn}^{++} + \text{Mn}^{++++}$. M. and N. reject this hypothesis, since the yellowish brown ppts. obtained by autoxidn. of Mn in alk. soln., and by alk. hydrolysis of manganic salts give only manganic salts on soln. in acids, and with CH_3Ac_2 give a manganiacetylacetonate, proved by vapor d. detns. to contain only Mn^{+++} . Moreover, $\text{Mn}(\text{OH})_2$ cannot be autoxidized. Sem does not believe it necessary that the supposed compd. MnO.MnO_2 should be autoxidizable, but M. and N. find that mixts. of MgSO_4 and MnCl_2 in NH_3 soln. give on autoxidn. not MgO.MnO_2 , corresponding to the supposed MnO.MnO_2 , but mixts. of MgO or $\text{Mg}(\text{OH})_2$ with Mn_2O_3 or $\text{Mn}(\text{OH})_2$, and the same is true of ZnSO_4 . Sem's chief argument for his hypothesis is the formation of MnO_2 by acid hydrolysis, which M. and N. have shown to be a secondary effect. It is admitted, however, that the Mn^{+++} ion is very unstable, and that the reaction $2\text{Mn}^{+++} = \text{Mn}^{++} + \text{Mn}^{++++}$ is complete; also that Mn^{++++} is still less stable than Mn^{+++} , and immediately forms MnO_2 , which is hydrolyzed to H_2MnO_3 . A modified form of the Sacher method (C. A. 9, 2043) for detecting small amts. of Mn is given, consisting in making the soln. alk. with NH_3 , allowing to autoxidize by warming, filtering off the ppt. and spreading the paper on a watch glass, then treating the ppt. with a few drops of concd. H_3PO_4 . Mn gives a reddish violet color, which is not disturbed by large amts. of Fe. This test is not as sensitive as the PbO_2 reaction.

M. R. SCHMIDT

Ethylstannic acid and derivatives. J. G. F. DRUCE. *J. Chem. Soc.* 119, 758-63 (1921).—The acid was prepd. by adding 30 g. SnCl_2 in 100 cc. warm EtOH slowly to a cold soln. of 46 g. KOH in 200 cc. water until the ppt. did not redissolve on shaking. To the mixt., filtered after 1 hr., 20 g. EtBr was added and this mixt. shaken at intervals during 1 hr.; after 3 days the EtOH was evapd. off, the soln. faintly acidified with dil. HCl, the ppt. washed and dried in air or over H_2SO_4 . Freshly pptd. the acid is white and gelatinous but becomes yellow-brown, transparent and horny on drying. It is infusible but decomp. below red heat, to a residue of SnO_2 ; in absence of air the residue is SnO . With the concd. acids $\text{C}_2\text{H}_5\text{SnBr}_2$, white, feathery crystals, and $\text{Et-SnCl}_2 \cdot 2\text{HCl}$, colorless, deliquescent prisms, were obtained. The iodide could not be prepd. The following salts of ethylstannic were prepd.: K, Na, Cu, Mg, Ba; basic salts: Ag, Zn, Hg, Co, Ni, Mn, Sr. The acid is apparently analogous to the fatty acids, Sn is certainly bivalent and, following Brauner, the formulation is proposed.



A. R. MIDDLETON

Perphosphoric acid and perphosphates. F. H. FUHRMANN. *Chem. Ztg.* 45, 437-8(1921).—The various methods for prepn. of these compds. are collated from the patent literature. All involve the action of H_2O_2 or Na_2O_2 on ortho- or pyrophosphates. For technical prepn. Na_2O_2 is preferable. This should be mixed with crushed ice and the other component in the most concd. form possible added cautiously. The mixt. is then brought to dryness as rapidly as possible. According to the patent literature perphosphate solns. are considerably more stable than perborate solns. and would be preferable for bleaching and oxidizing baths.

A. R. M.

Preparation of selenic acid. JULIUS MEYER and HANNS MOLDENHAUER. *Z. anorg. allgem. Chem.* 116, 193-200(1921); cf. C. A. 9, 2744.—Full details are given of a method by which $\text{H}_2\text{SeO}_4 \cdot \text{H}_2\text{O}$ can be easily and rapidly prepd. in large amts. and nearly the theoretical yield. 100 g. red or powdered gray Se is stirred up with 100 cc. water and dissolved to H_2SeO_4 by gradual addition of 150 cc. concd. HNO_3 and careful warming on a water bath. The soln. is evapd. to 100 cc. and treated with HClO_3 soln. made by adding a cooled mixt. of 27 g. concd. H_2SO_4 and 50 cc. water to a soln. of 93 g. $\text{Ba}(\text{ClO}_3)_2$ in 400 cc. water. A slight excess of Ba salt must be in the HClO_3 soln. to remove traces of H_2SO_4 present in the Se. The filtered soln. is added gradually and with const.

stirring to the HNO_3 soln. of H_2SeO_3 and the mixt. evapd. over a free flame to 300 cc., filtered through asbestos and in a vacuum distn. flask further concd. on the water bath; a slight stream of air is led through the liquid by means of a capillary, until the liquid becomes colorless and the pressure reaches 50–60 mm.; the liquid is then placed on an oil bath at 150° to slight cloud formation when the pressure sinks to 30–40 mm. Yield, 190–200 g. 85–90% acid. Traces of Cl compds. and $\text{Ba}(\text{HSeO}_4)_2$ are usually present; they may be removed by adding 2–3 vols. water to the cold acid, letting stand overnight, filtering, and concg. as before. In winter cold this acid deposits the monohydrate readily. Above 160° H_2SeO_4 was found to decomp. slowly to H_2SeO_3 with release of O_2 . An investigation of the reaction $\text{H}_2\text{SeO}_3 + \text{Cl}_2 + \text{H}_2\text{O} = \text{H}_2\text{SeO}_4 + 2\text{HCl}$ showed the reducing action of HCl to be the chief factor. Action of Cl_2 on H_2SeO_3 in concd. HNO_3 with the calcd. amt. of $\text{Pb}(\text{NO}_3)_2$ pptd. PbSeO_4 which after sepn. of Pb by H_2S and subsequent concn. gave 85% H_2SeO_4 in 40% yield. A. R. M.

Action of sodium hyposulfite on salts of the platinum group metals. GEZA SAILER. *Z. anorg. allgem. Chem.* 116, 209–12 (1921).—By the action of $\text{Na}_2\text{S}_2\text{O}_4$ on chlorides of the metals in alk. or neutral soln. the following new compds. were obtained: $\text{Na}_2[\text{Rh}_4(\text{SO}_3)_7] \cdot 12\text{H}_2\text{O}$, brownish red; $\text{Na}_4[\text{Os}_4(\text{SO}_3)_7] \cdot 24\text{H}_2\text{O}$, dark violet; $\text{Na}_3\text{H}_2[\text{Ru}(\text{SO}_3)_4]_4$, brownish yellow. Analysis of the compds. is not mentioned. A. R. MIDDLETON

Compound formation and solubility in systems of the type sulfuric acid; metal sulfate. JAMES KENDALL AND ARTHUR W. DAVIDSON. *J. Am. Chem. Soc.* 43, 979–90 (1921); cf. *C. A.* 15, 35.—The work on this subject begun by Kendall and Landon is here completed. The new acid compds. are $\text{BaSO}_4 \cdot 3\text{H}_2\text{SO}_4$, $\text{CaSO}_4 \cdot 3\text{H}_2\text{SO}_4$ (2 modifications); $\text{MgSO}_4 \cdot 3\text{H}_2\text{SO}_4$; $\text{ZnSO}_4 \cdot x\text{H}_2\text{SO}_4$; $\text{FeSO}_4 \cdot x\text{H}_2\text{SO}_4$; $\text{Hg}_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$; $\text{Ag}_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$ (2 modifications with transition pt. at 66°). Compd. formation is dependent upon the position of the metal with respect to H in the electromotive series. Only those much above H (Li, K, etc.) or much below (Hg) show extensive acid salt formation. The solubilities follow exactly the same rule, the sulfates of metals farthest from H being most sol. in H_2SO_4 , and those of metals with electrode potentials near zero practically insol. G. L. CLARK

Organic derivatives of thallium (GODDARD) 10. Organic derivatives of silicon (KIPPING) 10. Organic derivatives of tellurium (VERNON) 10. The hydrolysis of dichloro and hexa-aquo chromic chloride (LAMB, FONDA) 2. Ternary systems of potassium chloride, sodium chloride, and the chlorides of bivalent metals (SCHOLICH) 2. Ternary systems lithium chloride–sodium chloride–potassium chloride and calcium chloride–strontium chloride–barium chloride (SCHAEFFER) 2.

AUDLEY, J. A.: *Silica and Silicates*. London: Baillière, Tindall and Cox. 374 pp. 15s.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Interferometry of gas mixtures and solutions. F. LÖWÉ. *Jena. Chem. Ztg.* 45, 405–9 (1921).—A review with 9 cuts and a bibliography of 24 references.

J. H. MOORE

Action of surface adhesion in ring reactions. F. REISS. *Z. öffentl. Chem.* 26, 281–3 (1920).—The author and G. Diesselhorst have shown (*C. A.* 14, 390) that the greater the surface of contact between two layers of liquid, the more sensitive is the reaction in such cases as the diphenylamine reaction for nitrates; this increase in surface may be attained by carrying out the reactions in test-tubes contg. colorless glass beads.

J. C. S.

A new specific reaction for phenol. GEORGES RODILLON. *Sens. J. pharm. chim.* [7] 23, 136-7(1921).—A more striking, more delicate, and more sp. reaction for phenol than those produced by ferric salts or by bromine-water is given. To 10 cc. of the liquid to be tested, add one drop of a 10% aq. NaNO_2 soln., mix, and add without mixing a few cc. of pure H_2SO_4 . In the presence of phenol, a double ring appears at the zone of contact, emerald-green below, ruby-red above. If the liquid tested contains substances colored by H_2SO_4 , the phenol must be previously isolated by the usual methods.

F. F. HEYROTH

Volumetric estimation of the methoxyl group. J. TROEGER AND E. TIEBE. *Arch. Pharm.* 258, 277-87(1920); *J. Chem. Soc.* 120, II, 135.—The demethylation of cusparine by means of dry HCl (cf. Troeger and Mueller, *C. A.* 9, 2079) is quant. in respect to both the pyrocusparine and the MeCl produced. Expts. have, therefore, been performed to ascertain how far this method may be generalized. The material (0.1 g.), in a boat, is placed in a tube surrounded by a mantle, fitted with an observation window and a thermometer. Air having been displaced by dry HCl , the apparatus is heated until bubbles of gas are seen to be escaping from the substance. The MeCl so produced is collected in a nitrometer, most suitably over 30-35% NaOH soln., which only absorbs 0.3 cc. of the gas per hour, as against 7.0 cc. by H_2O . In order to conserve the alkali, a T-piece is fitted between the decompn. tube and the nitrometer, through which the gas used to displace air is allowed to escape. It is unnecessary to correct for the vapor tension of H_2O , but allowance must be made for absorption of the gas, as just indicated, and for the presence of air, which originates from the concd. acid used to generate the HCl . This is detd. as the unabsorbed residue when the gas collected is transferred to a eudiometer over H_2O . The results obtained with a number of alkaloids, while not absolutely accurate, gave a clear indication as to the number of CH_3O groups present, but with compds., for example, anisic acid, which volatilize below the temp. necessary, the results are, naturally, valueless. While the Zeisel method is not applicable to compds. containing S, the present method gives an approximate value in the case of galipine-sulfonic acid, although not in another instance.

W. O. E.

Determination of tartaric acid by the polarimeter. ANGELO COPPADORO. *Giorn. chim. ind. applicata* 2, 613-6(1920).—C. gives the following methods for polarimetric detn. of tartaric acid. (1) For tartaric acid solns. containing possibly other free, optically inactive mineral or org. acids: Add K_2CO_3 in slight excess, boil to eliminate CO_2 and concn. in a porcelain dish almost to dryness. Take up in the smallest amount of H_2O and wash the dish repeatedly with a 20-25% KCl soln. Transfer soln. and washings to a small graduated flask, and bring to vol. so as to have the greatest possible concn. of tartaric acid. Polarize, using a 40 cm. tube, then C (concn. of tartaric acid, or wt. per 100 cc. soln.) = $(100\alpha/4) \times 41.16$, α indicating the observed rotation. For tartaric acid $[\alpha]$ was found to be equal to 44.16. (2) For K bitartrate: Dissolve a given wt. in HCl and proceed as above. (3) For Ca tartrate: Dissolve a given wt. in HCl , then treat with a certain excess of concd. K_2CO_3 soln. to neutralize the acid and to ppt. the Ca as CaCO_3 . After prolonged boiling, bring the whole to vol. in a graduated flask, filter, take half of the initial vol., evap. almost to dryness, and proceed as in the first case, keeping in mind that only half of the initial soln. is employed. These methods can be used only for detn. of tartaric acid in substances that contain absolutely no other substances possessing optical activity. The above methods are based upon the fact that the sp. rotatory power of free tartaric acid solns. varies considerably with the concn. and temp., whereas that of solns. of K bitartrate, to which is added a large quantity of KCl (which must be in excess of 10% of the soln.) may be considered as practically const. within not too wide limits of temp., and has a value $[\alpha] = 28.04$. Animal charcoal may be used to decolorize colored solns. of tartaric acid without vitiating the results.

ROBERT POSMONTIER

Report on inorganic plant constituents. J. H. MITCHELL. *J. Assoc. Official Agr. Chem.* 4, 391-4(1921).—A report of the detn. of Ca, Mg, and Mn in a synthetic ash soln., which had approx. the compn. of the ash of certain seeds, cereals and legumes. Results for Ca were especially good and the results for Mg and Mn were satisfactory. Further work is planned and the elements Fe, Al, P, and Cl are to be considered.

F. M. SCHRETZ

The inversion and determination of cane sugar. A. R. ROSS. N. Y. Post-Graduate Med. School and Hosp. *J. Biol. Chem.* 46, 529-35(1921).—Cane sugar is readily inverted by hot picric acid and the fructose formed is not altered chem. in the process. The solns. should be so adjusted that the cane-sugar content does not exceed 0.1%, under which conditions inversion is complete in 3 min. at 95°. After inversion the mixt. is heated in the presence of Na_2CO_3 , and the picramic acid is detd. colorimetrically by the method of Myers and Bailey (*C. A.* 10, 1047). This method, which is used for samples containing minute amts. of glucose, can be employed satisfactorily for larger samples by modifying it as follows: Triturate in a mortar from 1 to 10 g. of the food sample with 100 cc. of H_2O , including the moisture of the sample, adding 0.5 g. of picric acid before the trituration, if the sugar content is known to be very low. It is also added when it may serve as a clarifying agent or to remove other reducing substances than the sugars. Centrifuge or filter the mixt. Transfer 1 cc. of the clear ext. to a 'sugar tube' (a long narrow test-tube of resistance glass graduated at 3, 4, 10, 15 and 20 cc.) containing 2 cc. of a satd. picric acid soln. and 1 cc. of 20% Na_2CO_3 soln. Heat in a boiling water bath for not less than 30 min. nor more than 1 hr. and est. colorimetrically in the usual way. When cane sugar is also to be detd., est. the reducing sugars as quickly as possible, using a picric acid soln. which has been chilled before it is mixed with the material to be extd. Very little inversion occurs at a temp. below 20°. To invert the cane sugar in the ext., mix 1 cc. of the ext. with 2 cc. of satd. picric acid soln. in a sugar tube and heat in boiling H_2O for 10 min. Add 1 cc. of 20% Na_2CO_3 soln. and heat for 30 min. The color which develops represents the total amt. of sucrose, glucose, and fructose (dextrin and maltose must be absent or accounted for). The difference in readings before and after heating with picric acid gives the equiv. amt. of cane sugar in terms of glucose. This method of inversion may also be used in polarization. The picric acid should be added in the form of a satd. soln. to give a concn. of from $\frac{1}{2}$ to $\frac{2}{3}$ satd. and the mixt. should be heated not more than 20 min. The presence of the picric acid seems to render the observations easier and in many instances acts as a clarifier and also as a remover of sol. proteins.

A. P. LOTHROP

Detection and estimation of chromium in steels. A. TERNI AND P. MALAGUTI. *Giorn. chim. ind. applicata* 2, 559-61(1920); cf. *C. A.* 14, 507.—The qual. test for Cr in steels may be carried out as follows: Treat the steel with dil. (1:2) HNO_3 in a test-tube, warm to elimination of nitrous vapors. Add a few drops of concd. HNO_3 and a little PbO_2 , and keep at boiling for about 1 min. Dil. with a little cold H_2O , filter (or decant) a portion of the liquid into another test-tube and test for Cr in the soln. by H_2O_2 and Fe_2O_3 . For the quant. detn. of Cr in steels, in presence of Fe, Mn, Ni, V, W, and Mo: Treat 1 g. steel with 30 cc. dil. (1:2) HNO_3 in a covered 250-cc. beaker, heat until nitrous fumes have almost ceased. Add 20 cc. concd. HNO_3 and about 1 g. PbO_2 and continue boiling until the vol. of the liquid is about 4-5 cc. Remove the flame, dil. with 30-35 cc. cold H_2O , add 25 cc. 30% NaOH , and heat again to incipient boiling. Transfer the whole to a graduated 500-cc. flask and also the washings from the beaker. Cool the flask rapidly under running water, dil. the liquid to the mark, and after shaking, filter through a large plaited filter. Place 200 cc. (corresponding to 0.4 g. steel) in a 1000-cc. conical flask, add 25 cc. 30% HNO_3 (freed of HNO_2 by prolonged boiling) and 5-10 cc. 10% KI and titrate with $\text{Na}_2\text{S}_2\text{O}_8$ soln. containing about 25 g. salt per l. (is standardized against 0.1 N $\text{K}_2\text{Cr}_2\text{O}_7$). The results

obtained are very exact, and the time necessary, about $\frac{1}{2}$ hr.

ROBERT S. POSMONTIER

A probable error in determinations by means of the hydrogen electrode (EVANS) 11B.

BERINGER, C. AND J. J. (revized by H. R. Beringer): *Text Book of Assaying*. London: Charles Griffin and Co., Ltd. 12s. 6d. For review see *Chem. Trade J.* **68**, 687(1921).

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MILLER, EDMUND H.: *Stoichiometry. The Calculations of Analytical Chemistry*. 3rd Ed. revized. New York: The MacMillan Co. 201 pp. \$2.00.

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8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

Translations in sulfur, periclase and chalcopyrite, simple gliding in bourmonite, pyrrargyrite, chalcocite and stromeyerite. O. MÜGGE. *Nachr. kgl. Ges. Wiss. Göttingen, Math.-physik. Klasse* 1919, 47-56.—The crystals were embedded in a fine powder of sulfur or clay and subjected to hydraulic pressure up to 35000 atm. Sulfur showed striations on (111) (113) (001) (011). The principal direction of translation is [110]. Periclase shows striations on (001) and (111), the principal direction of translation being as before [110]. The cohesion relations of periclase are very similar to those of rock salt. Chalcopyrite shows striations on (111) (201) (101) (203) (001). Bourmonite shows simple gliding with the gliding plane $\kappa = (110)$ and the basal zone $\sigma_2 = [110]$. Pyrrargyrite $\kappa = (10\bar{1}4)$, $\sigma_2 = \{0001\}$. Chalcocite shows two planes of gliding $\kappa = (201)$, $\sigma_2 = [100]$ and $\kappa = \{131\}$, $\sigma_2 = [110]$. Stromeyerite $\kappa = (201)$, $\sigma_2 = [100]$. The lattices of pyrrargyrite, bourmonite and chalcocite are discussed from the standpoint of these observations.

R. S. DEAN

So-called hydrocastorite from Elba. PROBO COMUCCI. *Atti accad. Lincei* 29, I, 264-7(1920).—Doubts have been cast by Manasse (*Neues Jahrb. Min. Geol.* 1901, II, 28-31; *Atti. soc. Toscana sci. nat. mem.* **17**, 203-27(1900)) and D'Achiardi (*Proc. verb. soc. Toscana sci. nat. Pisa* **14**, 89-96) on Grattarola's view that hydrocastorite represents a definite mineral species (*Neues Jahrb. Min. Geol.* 1867, 411). C's analysis of Grattarola's mineral gives the percentage compn.: H_2O 16.60, SiO_2 56.63, Al_2O_3 18.73, Fe_2O_3 0.42, CaO 5.56, $Na_2O + K_2O$ (by difference) 2.04. From these results and from the physical properties of the mineral C. draws the conclusion that it represents, not a definite mineral, but either a mixt. of certain secondary minerals of uncertain and varying compn. or, sometimes, simply somewhat impure stilbite. J. C. S.

The mineralogical and the feldspars. I. HAROLD ALLING. *J. Geology* 29, 193-294(1921).—An application of the phase rule and thermo-equil. diagrams to the feldspars. The feldspars belong to a 5-component system, but for most purposes it is only necessary to consider the K, Na and Ca. The plagioclase and the hyalophane series constitute a series of solid solns. while the K-Na and K-Ca series possess only

limited soly. and constitute eutectiferous systems. It is believed that both the K and Na feldspars are dimorphous, each existing in 2 isomeric forms, depending upon the temp. and viscosity of the magma. Some feldspars contain nephelite in solid soln. but this mineral cannot be regarded as isomorphous with the normal feldspars. Some adularias and microclines show microclitic twinning in thin sections but not in thin plates, which suggests that the operation of grinding possibly caused the inversion of the metastable Na orthoclase to Na microcline. Many-zoned plagioclase feldspars are to be explained by the process of normal crystn. under rapid chill instead of magmatic corrosion, while others are the result of complex processes in which the phenomenon of undercooling plays an important role. The application of the physical-chem. principles to the feldspar system may also furnish a means of solving such practical geological problems as the location of a fault or the origin of amphibolites. W. F. HUNT

The cerium minerals of Bastnäs at Riddarhyttan. PER GEIJER. *Sveriges Geol. Undersökning, Årsbok* (Swedish Geol. Survey, Yearbook) 14, 24 pp. (1920).—A detailed description of this rare-earth deposit, believed to be a contact-metamorphic replacement of limestone, and its minerals. The principal of these are bismuthinite, molybdenite, chalcopyrite, linneite, quartz, magnetite, bastnaesite, lanthanite, malachite, fluocerite, actinolite, allanite, cerite, and talc. The fluocerite is a new report; it has been recognized optically. The bastnaesite occurs in individual grains, and as alteration products; new optical data on it ($\omega = 1.7225$) are given. The allanite (orthite) is usually stated to contain only 0.3 to 0.5% H₂O, but analysis by Mauzelius showed the correct figure to be 1.52%, so that the formula corresponds well with that of the epidote group. Cerite, the mineral in which cerium was discovered, occurs only at this locality. It has been regarded as variable in composition, but analyses have mostly been made on altered material, and the most nearly correct one appears to be Nordström's, which gives $2(\text{Ca}, \text{Fe})\text{O} : 3(\text{Ce}, \text{La}, \text{Nd})_2\text{O}_3 : 6\text{SiO}_2 : 3\text{H}_2\text{O}$. Its β is about 1.81. The new mineral *toernebohmlite* is named after the late A. E. Törnebohm, a pioneer in the geological study of the Archean rocks of central Sweden. It occurs in the cerite ore, though more closely associated with allanite than with the cerite. It might be supposed to be the original mineral from which the cerite has been derived by hydration, but paragenetically it appears to be later than the cerite, and as no intermediate stages can be recognized, this view is untenable. Its physical properties are: Color, light green to olive; luster vitreous; H. 4.5; sp. gr. 4.94. Shows no crystal faces, but from optical properties and relations with allanite is inferred to be monoclinic. Optical properties: n_s near those of cerite ($\beta = 1.81$), but double refraction much higher: $\gamma - \alpha = 0.030$, though $\beta - \alpha$ is but 0.001. Biaxial, with a moderate axial angle; $2E = 49^\circ$, $2V$ probably about 26° . Sign +. Dispersion very strong, $v > \rho$. Remarkably pleochroic, with α light rose to greenish yellow, β bluish green, and γ light rose; absorption $\beta > \alpha = \gamma$. It is striking that there is a marked difference in absorption between axes which show little difference in n . Material was carefully selected for analysis so as to avoid admixture of cerite, allanite, and bastnaesite. Minute amounts of chalcopyrite and molybdenite could not be sepd. but these introduce no difficulty. It is slowly sol. in hot concd. HCl. The small sample obtained was analyzed by R. Mauzelius, giving: SiO₂ 22.05, Ce₂O₃ 27.52, (La, Nd)₂O₃ 34.85, Al₂O₃ 8.55, FeO 1.91, MnO 0.05, MgO 0.49, CaO 0.23, F₂ 0.29, ign. 1.70, chalcopyrite 0.96, insol. 0.95, sum 99.55%. This is regarded as corresponding essentially to $\text{H}_2\text{O} : 3\text{R}_2\text{O}_3 : 4\text{SiO}_2$, or $\text{R}_3(\text{OH})(\text{SiO}_3)_2$. It is suggested to be related to topaz and to cerite. E. T. W.

Fluocerite and tysonite. P. GEIJER. *Geol. För. Förh.* 43, 19-23 (1921); cf. preceding abstract. G. has compared the fluocerite from Broddbo, described by Berzelius, the fluocerite from Oesterby, described by Weibull and the tysonite from Pike's Peak, described by Allen and Comstock and includes a table giving all available analyses of these minerals. He finds that they must be considered one and the same mineral

species, with the formula $(\text{Ce, La, Nd})\text{F}_3$. G. verified certain data using the specimens originally used by Berzelius and by Weibull. Both fluorites and the tysonite are hexagonal: no difference in axial ratio has been proved. The optical properties and the cleavages are identical. The differences in sp. gr. are not greater than may be expected in view of the more or less altered state of the minerals. Berzelius reported the sp. gr. of the Broddbo fluorite as 4.7. G. redetd. this from Berzelius's specimen and found 5.73, concluding that Berzelius's figure was probably due to a typographical error. Waiving this discrepancy, G. prefers the name fluorite for the mineral.

W. SEGERBLOM

The Chuquicamata enterprise. I. A. W. ALLEN. *Mining Sci. Press* 122, 779-84 (1921).—The ore body comprizes a shear zone within a granitic area of country rock. Mineralizing solns. from below deposited primary ore minerals enargite and cupriforous pyrite in fissures and joint planes. Subsequent oxidation changed the minerals to brochantite, and chalcocite was deposited from leaching and secondary enrichment. 700,000,000 tons of 2.12 % ore have been developed. A description of the leaching plant is given.

A. H. HELLER

Mineral deposits between Lillooet and Prince George, British Columbia. LEOPOLD REINECKE. Can. Dept. Mines, Geol. Survey, *Memoir* 118, 129 pp.(1920).—Deposits of hydromagnesite, calcareous tufa, epsomite, Na_2CO_3 , clay, diatomaceous earth, lignite, peridot, mica, chromite, molybdenite, Mn, Ni, Au, Ag, Cu and Pb are described.

G. W. STRATTON

The Reed-Wekusko map-area, Northern Manitoba. F. J. ALCOCK. Can. Dept. Mines, Geol. Survey, *Memoir* 119, 47 pp.(1920).—The history, general character, general geology and economic geology of the district are given. The chief ore deposits are Au-bearing quartz veins, the most important of which are situated along the north-east shore of Wekusko Lake. There are also some small deposits of molybdenite and galena in the area, but none of com. importance.

G. W. STRATTON

Sixtymile and Laude rivers area, Yukon. W. E. COCKFIELD. Can. Dept. Mines, Geol. Survey, *Memoir* 123, 60 pp.(1921).—Placer Au is the only mineral of this area of economic importance. Some coal deposits have been discovered. The general characteristics, topography, geology and mineral resources of the area are given.

G. W. STRATTON

The Malagash salt deposit, Cumberland Co., N. S. A. O. HAYES. Can. Dept. Mines, Geol. Survey, *Memoir* 121, 24 pp.(1920).—The physiography, stratigraphy, structural geology and drill records and mining of the deposit are given. Salt springs in N. S. and N. B. also are considered. An average sample from a bed 4 ft. thick, which is now being marketed, contained 98% NaCl. Another bed of clean cryst. NaCl 21 ft. 6 in. thick has been encountered in diamond drill borings. There are large accumulations of K-bearing sediments in the strata.

G. W. STRATTON

Rock salt deposits of Cammarata. ERCOLE CERASOLI. *Giorn. chim. ind. applicata* 2, 427-32(1920).—The topics discussed are: General considerations upon the salt deposits of Sicily; salt mines of Cammarata; chem. examn. of the rock salt.

ROBERT S. POSMONTIER

Alleged phosphate deposits of Cirenaica. A. C. *Giorn. chim. ind. applicata* 2, 513-7(1920).—Abstracts from a summary of an expedition by Vittorio Simonelli (*Giorn. agri. della Domenica di Piacenza*, July 4, 1920, and *L'Italia agricola*, Aug. 15, 1920). Samples of the rock formation gave P_2O_5 0.15 to 0.25%; those gathered by other official investigators gave P_2O_5 zero to 0.76%. Cf. C. A. 14, 1948. ROBERT S. POSMONTIER

The origin of petroleum: Trinidad as a field of study. P. CARMODY. *Pet. Times* 5, 585-7(1921).—The theories of the violent origins of petroleum, such as the action of H_2O on carbides, are being discarded in favor of more slowly working natural agencies. C.'s view inclines toward a vegetable origin for all C deposits that occur on or in the

earth's crust. The whole of the surface of the earth is or was at some time clothed with vegetation, some of which decays and is renewed annually, some at longer intervals, but whatever may be the interval, there is a continued increment of org. matter, which, over a period of years and a large area of surface, results in a huge accumulation in a modified form. The chem. nature of this vegetation is mainly cellulose, and cellulose contains about 44% C, which is a large contribution towards the higher % of C found in the best qualities of the coal deposits and other deposits rich in C. In Trinidad there are at least 3 oil horizons showing an interesting gradation according to age. The youngest (at La Brea) is the heaviest, and is more highly inspissated and the oil sand in this horizon contains a large % of org. matter, not bitumen. The Rio Blanco horizon with variations in the thickness of oil sands and intervening clays contains oils of different sp. gr. and of gasoline, Sand non-volatile residues. Some oils in the deepest Galesta horizon owing to natural filtration are so low in sp. gr. and light in color as to be reported as artificially distd. Analyses of many samples of liquid and semi-liquid oils are reported.

R. L. SIBLEY

Theory on the origin of hydrocarbons. H. L. FAIRCHILD. Univ. of Rochester. *Oil and Gas J.* 19, No. 51, 70(1921).—Under the new theory of earth origin (planetesimal) it is a reasonable conception that vast amts. of org. hydrocarbons were held in strata now hundreds of miles beneath the unaltered and observable rocks; and some or most of the deeply buried org. bitumens have been forced upward to be reservoired in porous strata or to form the H, CO₂, etc., of volcanic emanations. In this view it is not necessary to trace the source of an oil pool to some particular limestone or shale, although in some cases this may be reasonably sure.

R. L. SIBLEY

Mid-continental geological studies. F. L. AURIN, G. C. CLARK, AND E. A. TRAGER. *Oil and Gas J.* 19, No. 51, 84-8(1921).—A study of the pre-Pennsylvanian stratigraphy of the Northern Mid-Continent oil fields, based on logs of various wells drilled to the Mississippian limestone or deeper.

R. L. SIBLEY

Geology of the Peruvian oil fields. V. F. MARSTERS. *Oil and Gas J.* 19, No. 46, 78-80(1921).—The 3 important producing areas are associated with determinable structural conditions. The petroleum from the northern fields contains from 15 to 25 % naphtha and gasoline, 24% kerosene, while the remaining part shows approximately 35% of lubricants of different grades. The oil contains an asphaltic base. The production obtained in the Pusi area contains a paraffin base with little or no gasoline and from 7 to 20% kerosene. In the remaining part, there is evidently very considerable lubricant although no figures are given.

R. L. SIBLEY

The need of quantitative methods in applied geology. CHARLES H. WHITE. *Mining Sci. Press* 122, 601-5(1921).—W. goes into detail regarding the precision of geological technic and the science of geology, with remarks on the birth and advance of chemistry. As an example of the need of quant. methods in geology, W. cites vulcanism, and urges further study of the gases emitted from volcanoes. Examples of outcrops are given where W. found there was twice as much quartz in the ore-bearing outcrop as in the ground containing no ore. Practical hints and an outline are given for the application of quant. methods in geology to mine examn.

A. H. HELLER

Processes in the mineral world and their measurements. O. MÜGGE. *Nachr. kgl. Ges. Wiss. Göttingen, Geschäftliche Mitt.* 1919, 78-100.—In a geological process we are concerned with time or intensity and temp. and pressure. In measuring astronomical time we use the motion of the planets, which is independent of the temp. and pressure. For the measurement of geological time we may similarly use to advantage the analogous motions of the particles within the atom. Thus the decompn. of the radioactive elements is independent of temp. and pressure and if we compare, for example, the ratio of the amount of U present in a rock to the amt. of one of its de-

compn. products as He or Pb with the ratio which prevails after decompn. during a measureable time, we have a measure of the age of the rock. This calculation gives about 10^8 years for Paleozoic rocks. A further method of time measurement is to measure the amt. of color produced in certain minerals by the α rays of radioactive substances. Other methods of measurement are the devitrification of natural glasses and the agglomeration of finely divided decompn. products as well as the well known method of rate of sedimentation. All of these latter methods are, however, dependent to a marked degree on temp. For measuring geological temps. the m. p. of minerals may be used, but the m. p. of a mineral is affected by the magma with which it is in contact as well as by pressure and traces of volatile constituents. The so-called geological thermometer due to van't Hoff depends on the change of the solid phase in equil. with a given soln. at various temps. For higher temps., as in contact metamorphism, changes of form in quartz or other minerals may be used. The sepn. of a component of a solid soln. causing opalescence may also be used to indicate the highest temp. attained. The effect of pressure is particularly great when a volatile substance is involved in the process. Hydrostatic pressure may be detd. by its effect on the m. p. of minerals. Unequal pressure causes orientation of the crystal axes normal to the direction of pressure and the amt. of orientation is a measure of the inequality of the pressure.

R. S. DEAN

Apatite-magnetite deposits of Dhalbhum, India (MURRAY) 15. Formation of petroleum from fish oils (KOBAYASHI) 22.

STEINRIEDE, F.: Anleitung zur mineralogischen Bodenanalyse, insbesondere zur Bestimmung der feineren Bodenminerale unter Anwendung der neueren petrographischen Untersuchungsmethoden. Leipzig: Wilhelm Engelmann. 238 pp. M. 56. For review see *Chem. Weekblad* 18, 350(1921).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

Flotation tests of Idaho mines. CLARENCE A. WRIGHT, JAMES G. PARMELEE AND JAMES T. NORTON. *Bur. Mines, Bull.* 205, 70 pp.(1921).—The tests cover Pb-Zn ores from the Coeur d'Alene district. The general conclusions reached are: (1) A complete sepn. of the Pb and Zn sulfides by differential flotation is impossible owing to the intimate association of the minerals. (2) Fine grinding is essential to liberate most of the sulfide minerals and to permit their sepn. by differential flotation. (3) A better recovery is possible with an ore that has been crushed wet than with one that has been crushed dry. (4) A pulp density of about $2\frac{1}{2}$:1 to $3\frac{1}{2}$:1 (water to solids) seems to give the best differential selection and minerals recovery at normal temp. (5) Each ore seems to require a somewhat different flotative mixt. and the effect of a certain oil or chem. on one ore may differ from that on another similar ore. (6) Differential flotation effects a more satisfactory sepn. of the sulfide minerals than has been obtained by the existing methods. (7) A better differential selection of the Pb from the Zn sulfide is effected with an alk. or neutral pulp than with an acid pulp. (8) The quantity of the chem. or flotation agents used in the small-scale tests can be reduced in large-scale tests or in practice. (9) Soda ash, NaOH, sodium silicate, salt, lime, coal-tar, creosote, alc., gasoline and charcoal seem to assist in the selective sepn. and recovery of Pb sulfides in the presence of Zn and Fe sulfides. Their effectiveness, however, may be modified by the gang constituents of the ore. (10) CuSO_4 or some other Cu compd. such as CuCO_3 , when added to the pulp contg. soda ash after the Pb concentrate has been removed, seems to give good results in floating the Zn mineral in some of the ores.

(11) The Bradford SO_2 process seems to be adaptable to the sepn. of the Pb and Zn sulfides of some ores. R. S. DEAN

The fundamentals of heat losses in metallurgical furnaces. P. ROSIN. *Metall. u. Erz* 18, 37-45, 78-88, 99-104(1921).—A detailed mathematical consideration of heat losses with tables of heat conductivities of refractories. R. S. DEAN

Progress in iron metallurgy in recent years. K. DORNHECKER. *Z. angew. Chem.* 33, Aufsatzteil, 96-100, 103-4, 106-11(1920). E. H.

Primitive iron-ore smelting methods in West Africa. F. DIXEY. *Mining Mag.* 23, 213-6(1920). A. BUTTS

Blast furnace practice in Han-yang Iron and Steel Works. C. T. HUANG. *Science (China)* 6, 53-64(1921).—Four furnaces have a total daily capacity of 800 tons of pig iron. Both hematite and magnetite ores are used. A typical ore analyzes Fe = 60.36%. The furnaces are filled by hand. A detailed report is given of the methods pursued at this the largest blast furnace in China. Wm. H. ADOLPH

The dephosphorizing of Ilseider pig-iron in the converter and open-hearth furnace. ARTHUR JUNG. *Stahl u. Eisen* 41, 687(1921).—Several expts. are described in which it was possible to dephosphorize an Ilseider pig iron with about 3% P in an open-hearth furnace. The expts., however, show that a better dephosphorization is obtained in a basic converter. R. S. DEAN

Deoxidation reactions in the Thomas process. O. VON KEIL. *Stahl u. Eisen* 41, 605-11(1921).—The oxidation content of the metal has been shown to be greater before the deoxidation than after. By a more careful investigation of this phenomenon it was hoped to get further information on the deoxidation process. The results of expts. made at several converter plants show that at reduction temps. of 950-1170° the O content is greater before than after the deoxidation. The O content before the deoxidation varies greatly but after the deoxidation it is nearly const. The variations in the amt. of deoxidizer were small, being 0.2-0.5% Mn. This percentage of Mn caused a reduction of about 0.02% in the O content. Experimentally it was found that the addition of 2% Mn to a melt containing 0.15% O gave only a decrease of 0.25-0.30%. It may, therefore, be concluded that 0.02-0.05% Mn is an excess of deoxidizing agent and no further reduction in O content could be obtained without adding very much greater quantities of Mn. There is no doubt that the amt. of blast as well as the temp. and nature of the slag affect the O content of the iron but it is difficult to vary these factors independently. R. S. DEAN

Reactions in the basic open hearth. C. W. VEACH. *Foundry* 49, 380-2(1921).—With sufficient detailed supervision and proper regard for quality in selecting raw materials, basic open-hearth steel can be made to compare favorably with that of the acid process. Cleaning of scrap and use of Mn are important; not less than 0.30% of the latter should be present when all the metal is melted. Use of oil for fuel is desirable under conditions preventing formation of oxidizing flame and can be made practical. Slag inclusions can be prevented by keeping the bottom in good condition, using clean scrap and pig iron low in Si, keeping the tap hole small, firm, and low, adding to the ladle 3 lb. ferrosilicon per ton of metal charged, and allowing the ladle to stand long enough to permit Ti to function. Ti will not save a bad heat but is valuable in reducing silicates and in further purification. Part of the Fe-Si must remain on top of the metal until the slag begins to flow. More time given to melting and refining allows the bath to eliminate, by flotation, occluded gases and slag inclusions and causes deoxidation of FeO in slag. Procedures of heating are described, actions of C, P, Si and Mn are shown, and thermal values are given. A poor heat may be improved, but more often a first-class heat is made second-class by treatment while in the ladle. G. R. JACKSON

The McKune system for open hearth. P. S. YOUNG. *Blast Furnace and Steel Plant* 9, 371-4(1921).—An illustrated description. E. H.

New open-hearth furnaces at Brier Hill. GEORGE L. PRENTISS. *Blast Furnace and Steel Plant* 9, 368-70(1921); *Iron Age* 109, 1479-81(1921).—An illustrated description of an installation under the Egler patents. E. H.

The Bessemer process of making steel. JOHN SULLIVAN. *Assoc. Iron and Steel Elec. Eng.* 3, 85-98(1921).—A clear account is given of modern Bessemer practice, the history being touched upon and the chem. reactions involved being detailed. In the discussion of the paper, F. VON SCHLEGEL pointed out that as long as the iron from the blast furnace is going to go high in C and Si, and Fe ore is not a great deal higher than it is now, it is going to be cheaper to convert metal from the blast furnace by the Bessemer converter than by the elec. furnace. If the blast furnace is to continue, the best place that the elec. furnace can hope for in the steel field is as a substitute for the open-hearth furnace in the duplex process. Comparative costs are given for a plant producing 5000 tons of high-grade, soft steel per month. From the standpoint of first cost of plant the elec. furnace process or the cupola-converter-etc. process is the cheapest. Tests at Homestead Works were reported by GORDON FOX: The disposition of the total available heat in the open hearth is as follows: In steel at tapping, 14.16%; in slag at tapping, 3.3%; in reduction of ore and calcination of limestone, 2.78%; leaving outgoing ports and entering checkers 62.45%; absorbed in checkers 22.93%; lost between checkers and stack 4.53%; stack loss 34.99%; radiation and conduction losses 17.31%. The thermal efficiency of regenerators, ratio of heat imparted to that absorbed, ranges from 20 to 38%. The McKune process is briefly touched upon. C. G. F.

War plant of Erie Forge and Steel Co. SIDNEY G. KOON. *Iron Age* 107, 1593-1603(1921).—An illustrated description. E. H.

Steel from the standpoint of marine engineering. W. H. HATFIELD. *J. West Scotland Iron and Steel Inst.* 28, 52-78(1921).—H. discusses the uses made of various kinds and conditions of steel and gives many useful data. The following topics are treated: Ingots, heat-treating, mechanical testing, plates and sections, forgings, reduction gearing, steel castings, steels available for various uses, case hardening, corrosion, rustless steel, Cr-steels, Ni-steels, and steel for turbine blades. Special attention is given to the relations between chem. analysis, manufacturing processes, and physical and mechanical properties. H. points out (1) the desirability of using, wherever possible, ship plates and sections of increased mechanical strength, (2) the advisability of extending the use of some of the special steels now available for power unit and transmission parts, and (3) the desirability of increased use of other special steels available for resisting rust and, where necessary, high temps. The appendix contains a detailed description of each of the 12 mechanical tests used and a detailed table of ship elements giving the nature of stresses, intensity of work, material used, and specifications for each part. A number of interesting photomicrographs are given. In a discussion which follows, the values of the Wohler and Izod tests are debated. F. W. COBB

Antimony in 1919. FRANK C. SCHRADER. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part I, 287-311 (preprint No. 14, published June 6, 1921) E. H.

The smelter of the Calaveras Copper Co. EDWARD H. ROBBIE. *Eng. Mining* 7, 111, 984-7(1921).—An illustrated description of the plant and process. E. H.

The sources of loss in zinc smelting and the mechanism of the metal vaporization. O. MÜHLHAUSER. *Metall u. Erz* 18, 1-22, 45-57(1921).—The loss of zinc through spinel formation is important only during the first week of use of a new retort; thereafter the amount of spinel present remains practically const. Silicate formation is unimportant. The loss due to zinc remaining in the residue remains practically const. throughout the life of a retort and depends largely on the amt. of charge in a retort and the proportion of anthracite used. It would be supposed that with muffles made of the same clay and prepd. in the same way the loss through metal vaporization would be

consistent. This, however, is not the case, since the muffle may become more permeable through the formation of cracks or less permeable by glazing. This permeability not only allows the zinc vapor to diffuse out but the diffusion of nitrogen and combustion gases into the muffle affects condensation. The world's production of zinc in 1911 was 895,409 tons and about 5% of this amount was lost in residues and 7% in vaporization losses. It is, therefore, important to make an intensive study of zinc losses. R. S. DEAN

Extraction of tin from ores. JEROME J. COLLINS. *Mining Mag.* 23, 285-8(1920).—The main features of the usual method of extg. tin are: (1) Crushing in stamp-mills, (2) dewatering of the wet pulp, (3) sizing or hydraulic classification, (4) concn. of the classified pulp, (5) roasting concentrates, (6) re-concn. of roasted product, (7) smelting for metallic tin. The first six of these operations take place at the mines, yielding concentrates of 60-70% Sn from ore of 0.5-5.0% Sn, and these are sold to smelters. Losses of metal occur at various points in the process; the recovery at Cornwall is only 65%. One of the chief difficulties is with crushing, as too coarse particles mean mineral not sepd. from the gang and too fine crushing means much slime, which is difficult to treat. Two or three re-treatments of tailings are practiced at Cornwall, after which slime and tailings are discharged into the Red River. These are re-concd. by the river itself and tin streamers at intervals skim off the concentrate and re-treat it. Finally the tailings are washed out to sea, where there is further concn. by the sea and material is washed up on the beach, which is skimmed and tin oxide recovered. Expts. are being carried on with oil flotation instead of hydraulic concn., and are said to be meeting with much success. However, C. believes that a chem. method is the best way to avoid the present waste of metal, and has developed experimentally a method of chloride volatilization. The ore is crushed dry and roasted in a multiple-hearth furnace. S and As are roasted off on the first two hearths, while the next hearths are made reducing, excluding all air. The final hearth is a water-jacketed cooling hearth in which the reduced ore is cooled in a reducing atmosphere to prevent re-oxidation of metallic tin. The cooled ore is dragged in a thin layer through dry Cl gas, and is then heated to about 120°, slightly above the b. p. of SnCl₄. The vapor is condensed or absorbed in water and the metal can be recovered electrolytically or by replacement with Zn. The roasting requires about 12 hr., 4 hr. to each of the three stages. The product is of better than standard grade. A. BURTS

The development of the tungsten industry. G. MICHEL. *Technique moderne* 11, 527(1919); 12, 22-4(1920).—Outline of the principal uses of W, of its various ores (from the point of view of production and consumption), of the detn. of WO₃ and Sn in the ores, and of the prepn. of W powder and of ferro-W. A. P. C.

Manufacture and uses of tungsten. W. E. JOHN. *S. African Industry; Mining Sci. Press* 122, 879-80(1921).—The treatment consists of reducing the ore to a fine powder, mixing with Na₂CO₃ in excess of the WO₃ content of the ore, and fusing to Na₂WO₄ in a reverberatory furnace at 800°. After cooling and crushing the Na₂WO₄ is leached out with hot water. After filtering the filtrate is treated at a boiling temp. with CaCl₂ and a ppt. of CaWO₄ is formed. This is washed and boiled with HCl to form H₂WO₄, usually about 99.53% pure. In order to form a pure tungsten metal the ppt. is boiled with NH₄OH to form a soln. of ammonium paratungstate, which is boiled down to a white mud and treated with c.p. HNO₃ to form H₂WO₄. This last process is often repeated to obtain a sufficiently pure product. The H₂WO₄ is fired in silica crucibles at 1000° to form WO₃, and this is reduced to powdered W by firing in a closed furnace at 1200° in the presence of a current of H. The powder is pressed into bars and sintered in the presence of H at 3000°. The physical and chemical properties, and various uses of tungsten are given in detail. A. H. HELLER

Metal-spraying machines. W. KASPEROWICZ. *Elektrochem. Z.* 27, II, 37(1921).—A short review. C. C. F.

Metal-spraying as used in the chemical and electrochemical industries. NIKOLAUS MEURER. *Elektrochem. Z.* 27, I, 81, 93(1921).—A detailed illus. review.

C. G. F.

Metal-casting practice. ANON. *Elektrochem. Z.* 27, II, 33, 37, 43(1921).—A review.

C. G. F.

Centrifugal castings. ANON. *Engineering* 111, 311-12(1921).—Centrifugal castings are considered and a description of a casting machine is given. V. O. HOMERBERG

New method for calibrating Brinell hardness testing machines. J. L. JONES AND C. H. MARSHALL. *Proc. Am. Soc. Testing Materials* 20, II, 392-7(1920).—See C. A. 14, 3211.

V. O. HOMERBERG

The effect of temperature on the modulus of rigidity and the viscosity of solid metals. KEI IOKIBE AND SUKESAKI SAKAI. *Sci. Reports Tohoku Imp. Univ., Sendai Japan* 10, 1-27(1921).—This is the full report of the work, an advance abstract of which was previously published under the title "The change of rigidity and logarithmic decrement of different metals by heating" (C. A. 14, 2905).

P. P. P.

Crystalline structure of metals. ZAY JEFFRIES AND R. S. ARCHER. *Chem. Met. Eng.* 24, 771-9(1921).—Crystallinity is defined and briefly considered. The methods used in the application of X-ray analysis to the study of atomic spacing are described, together with a statement of the results thus far obtained on metals.

V. O. H.

Aluminium and its alloys. W. ROSENHAIN. *J. Roy. Soc. Arts* 68, 791-8, 805-17, 819-27(1920).—The manufacture, physical and mechanical properties, microstructure and uses of Al and its alloys are considered.

V. O. HOMERBERG

Castings of light aluminium alloys. ROBERT J. ANDERSON. *Iron Age* 107, 433-6(1921).—The value of macroscopic examn. in foundry practice and its correlation with the microstructure are considered. The methods used are discussed and macrographs of typical structures are given.

V. O. HOMERBERG

Aluminium alloys and their applications. ANON. *Met. italiana* 13, 49-54(1921).—Review. The topics considered are: Al alloys in general, Al-Zn, (Zinialium), Al-Cu, Al-Mg (Magonalium), Al-Ni, Fe-Al, other binary alloys, ternary and quaternary alloys.

ROBERT S. POSMONTIER

Tempering of steels. N. PARRAVANO. *Met. italiana* 13, 156-70(1921).—A review of the various theories advanced to account for the phenomenon of tempering of steels, illustrated by photomicrographs and diagrams.

ROBERT S. POSMONTIER

French specifications for carbon steels. ANON. *Iron Age* 107, 1373-4(1921).—Full details are given for bars, blooms, billets and slabs of other than tool steels. Requirements pertaining to static, structure and shock, as well as welding tests, are given.

V. O. HOMERBERG

Constitution of chromium-tungsten steels. ANON. *Chem. Met. Eng.* 24, 791-3(1921).—A review is given on the work of Honda and Murakami, throwing light upon the complex reactions giving self-hardening and red-hardness properties to modern high-speed steels. The views of Edwards on like subjects also are briefly given.

V. O. HOMERBERG

Static and dynamic tension tests on nickel steel. J. J. THOMAS AND J. H. NEAD. *Trans. Am. Inst. Mining Met. Eng.* No. 1073, 79-81(1921); cf. C. A. 15, 1482.—A discussion.

V. O. HOMERBERG

The protection of iron against rust. L. BARGERON. *Age de fer* 37, 1033-4(1921).—Very brief sketch of the various methods of protecting Fe from rust—coating with other metals (Zn, Cu, etc.), sherardization, use of Fe salts and of ferro-alloys, etc.

A. P.-C.

Breakage and heat treatment of rock-drill steel. BENJ. F. TILSON. *Trans. Am. Inst. Mining Met. Eng.* 1921, No. 1072-M. 21 pp.—On account of the wide variation in the conditions under which rock-drill steels are used there is great need for

a standard method for the study and the report of service tests on rock-drill steel. The author offers a standard form for these tests. Fatigue is undoubtedly an important factor in addition to the common causes (such as blow-holes, segregations, irregularities of form, etc.) in causing breakage of rock-drills. Curves are given which show that the depth of rock drilled between successive fractures diminishes. The impact of the piston of the rock-drill against the shank of the drill and the impact of the drill-bit against the rock set up waves of compressive stresses moving in opposite directions along the drill. The interference of these waves forms nodes of max. stress which can at times be located during drilling as isolated hot spots on the drill. Tests of electric butt-welded drill-steel show that this method of welding is successful. No bars welded by this process broke near the weld. The following soln. is suitable for *etching* identification markings on steel. To 4 parts of glacial AcOH add 1 part of abs. alc. and let stand for 12 hours; then add slowly and carefully 1 part of HNO₃ (sp. gr. 1.28). Do not put the soln. in a stoppered bottle until reaction has ceased. This may not be for several days but the soln. may be used immediately. It is applied in the usual way for about 15 min.

F. P. FLAGG

Punishment of rails. JAMES E. HOWARD. *Iron Age* 107, 1375-6(1921); cf. C. A. 15, 1126.—The mechanical and the thermal hardness, together with their causes, are considered.

V. O. HOMERBERG

Fractures in locomotive boiler tubes. HENRY FOWLER. *Engineering* 111, 466-7 (1921).—A consideration as to the brittleness and fractures occurring in a locomotive tube boiler of an engine that had been run about 60,000 miles is given.

V. O. HOMERBERG

Autogenous welding and cutting. ANON. *Elektrochem. Z.* 27, II, 55(1921).—An illus. review.

C. G. F.

Automatic arc welding. H. L. UNLAND. *Gen. Elec. Rev.* 24, 583-6(1921).—An illus. review.

C. G. F.

Desirability of standardization in the testing of welds. F. M. FARMER. *Engineering* 111, 239-42(1921).—A discussion is given of the tests of base metal, weld and filled-in metal. There should be a standardization test of proficiency of welders or perhaps several standards for different grades of welders and a standardized procedure for the inspection of various kinds of welds while they are being made.

V. O. H.

Welding of steel in relation to the occurrence of pipe, blowholes and segregates in ingots. H. BREARLEY. *Bull. Iron and Steel Inst.* Advance copy No. 2, 17 pp. (1921).—B. discusses a method for testing welded surfaces. A series of specimens cut resp. from the edge and center of the flat bar, the prepn. of which is described, are hardened and tempered in stages of 100° up to 700°. These bars are broken on a standard Izod machine, and the impact value of the edge specimen whose corresponding piece cut from the center is split along the weld, is taken as the welding figure. The figures obtained in this manner represent in Izod foot-pounds the degree of toughness which must be induced in the steels by hardening and tempering in order to pull the welded surfaces into a visible gap. The effect of segregates existing in ingot cavities on the weldability of the steel is considered. Also in *Blast Furnace and Steel Plant* 9, 361-7 (1921).

V. O. HOMERBERG

Carbon monoxide poisoning in American steel works, metal mines, etc. (FORBES) 11H. The conductivity of dilute alloys free from mixed crystals (LICHTENBERG) 2. The Chuquicamata enterprise (ALLEN) 8. Copper sulfate (Brit. pat. 161,656) 18.

GAGE: *Cours de Metallurgie*. Livre I. La fonte. 334 p. Livre II. Elaboration des fers et des aciers. 351 p. Livre III. Travail des fers et des aciers. 431 p. Livre IV. Essais mecaniques des fontes, des aciers et des fers. 320 p. Livre V.

Metallurgie des alliages metalliques et des metaux autres que le fer. 432 pp. Paris: Librairie de l'enseignement technique, 3 bis, rue Thenard. For review see *Bull. soc. encour. ind. nat.* 120, 412(1921).

HEYN, E. AND BAUER, O.: *Metallographie*. Leipzig: Otto Spamer. For review see *Chem. App.* 8, 100(1921).

PENZER, N. M.: *The Tin Resources of the British Empire*. London: William Rider and Son. 358 pp. For review see *Am. J. Sci.* 2, 58(1921).

Treating ores. TRENT PROCESS CORPORATION. *Brit.* 161,560, Feb. 4, 1921. Ores, flue dust, etc. suspended in H_2O are treated with a substantial proportion of oil and of a finely divided carbonaceous material such as coal, and the mixt. is agitated to form a mass contg. the metalliferous constituents of the ore, the coal, etc., and the oil, and not contg. the gang and impurities originally present in the ore and in the coal. The ore treated may be a froth concentrate. The carbonaceous and oily materials in the product constitute fuel for subsequent smelting or other treatment of the ore. Cf. *C. A.* 14, 3631.

Recovering tin from scrap. P. A. MACKAY. *Brit.* 161,654, Jan. 9, 1920. Sn scrap is treated with oleum to dissolve the Sn, and the material is then lifted out of the acid and washed in H_2O . Fresh acid is added to replace that used, and another batch is treated. After a time a basic sulfate $SnSO_4 \cdot SnO_2$ deposits and is drawn off. The washing water contains some suspended insol. SnO_2 and some Sn in soln. The dissolved Sn is recovered by pptn. as sulfide or Fe is added to neutralize the acid and obtain metallic Sn. External heat is not required in the process, but the acid bath is maintained by the exothermic heat and the periodical additions of fresh acid at a fairly const. temp. of 45–55° and a strength of about 10% free SO_4 .

Extracting metals; furnaces. C. A. STEVENS. *Brit.* 160,760, Feb. 14, 1921. In prepg. Al and other metals from ores, the ore is mixed with NaCl and a carbonaceous substance, with or without the addition of oxalates formed preferably by the inclusion of sawdust and alkali in the mixt. The mixt. is heated out of contact with air. A suitable construction is specified.

Alloys. R. WALTER. *Brit.* 160,792, March 24, 1921. Fe or steel alloys, which contain C, P, Ni, Cr, W, Mo, etc., contain also 0.001–0.1% of B.

Alloys. F. MILLIKEN. *Brit.* 161,104, July 6, 1920. See *Can.* 206,645 (*C. A.* 15, 499).

Hardening tools. W. TATE. *Brit.* 161,446, Apr. 22, 1920. In hardening tools, the tool is heated and hammered to form a skin or casing, again heated and placed in a mixt. of $K_4Fe(CN)_6$ and bone ash, whereupon the container is placed in a furnace and heated to bright redness. After a short time a further quantity of the powdered mixt. may be added. The tools are finally quenched in H_2O ; large tools may be clamped between metal plates during cooling.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER

Recent advances in science—Organic chemistry. P. HAAS. Univ. London. *Sci. Progress* 15, 544–7(1921).—Review of recent work in the chemistry of the *carboxhydrates* and of the *aliphatic acids*. Cf. *C. A.* 15, 1277. JOSEPH S. HEPBURN

Ludwig Gattermann. P. JACOBSON. *Ber.* 54A, 115–11(1921).—An obituary. E. J. C.

Further experiments on the bromination of unsaturated compounds with *N*-bromoacetamide. A. WOHL AND K. JASCHINOWSKI. *Techn. Hochschule Danzig.*

Ber. 54B, 476-84(1921).—The chief factors detg. the occurrence of an org. reaction which, unlike salt formation, is not brought about by bringing together free ions are: (1) the existence of a point having additive power, *i. e.*, a pair of secondary valences at a negative atom or a double bond between two adjacent C atoms, and (2) the presence of reactively influenced H, by the elimination of which the second stage of the reaction is made possible (*C. A.* 13, 1588). The reaction whereby bromination is effected with AcNHBr (*e. g.*, $\text{Me}_3\text{C}:\text{CMe}_2 + \text{BrNHAc} \rightarrow \text{Me}_3\text{C}:\text{CMeCH}_2\text{Br} + \text{AcNH}_2$) is, therefore, to be expected only with unsatd. compds. (*i. e.*, those with additive power) having reactively influenced H. This is confirmed both by the earlier and by the present work. Unless $\text{Me}_3\text{C}:\text{CMe}_2$, the satd. Me_3CCMe_3 is not attacked by AcNHBr. The unreactivity of cinnamic acid, ester and aldehyde and of fumaric and maleic acids, produced by the negative Ph or C:O groups, is overcome by the introduction of OEt or Me groups. While C_2H_5 and C_3H_7 , in spite of the unsatd. unions, fail to react owing to the absence of reactive H, CH_2 :CHMe is slowly brominated. In $\text{PhC}:\text{CMe}$ the Ph group greatly weakens but does not wholly overcome the reactivity; in $\text{PhCH}:\text{CH}_2$ the absence of reactive H prevents reaction. Allyl alc. and its Et ether react, as does the bromide, although more slowly. HCO_2H and its Me and Et esters react vigorously. $\text{C}_4\text{H}_9(\text{CO})_2\text{NBr}$ behaves like AcNHBr. Crotonic acid (4.3 g.) in 15 cc. cold Me_2CO allowed to stand 45 hrs. with 13.8 g. AcNHBr yielded a distillate of a penetrating odor, b_{15} 105-7°, followed by a few drops of liquid solidifying to white crystals, *m.* 83°, and having the compn. $\text{C}_4\text{H}_9\text{O}_2\text{Br}$ (found Br, 50.17; calcd., 48.47%). of a bromocrotonic acid. From 22.3 g. $\text{PhC}(\text{OEt}):\text{CHCO}_2\text{Et}$ in 30 cc. cold Et_2O treated in 3 portions in the course of 3 days with 13.8 g. AcNHBr was obtained 23 g. of the bromo ester $\text{PhC}(\text{OEt}):\text{CBrCO}_2\text{Et}$, a faintly yellow oil, b_{10-12} 120-5°, decolorizes cold KMnO_4 , adds Br in alc.; 10 g. in 60 cc. CCl_4 treated with 5.3% O_3 , allowed to stand overnight, dild. with 6 g. H_2O and boiled 7 hrs. under a reflux gives $(\text{CO}_2\text{H})_2$ and BzOEt . $\text{MeC}(\text{OEt}):\text{CHCO}_2\text{Et}$ (31.6 g.) in 40 cc. Et_2O treated in the course of 2 days in 4 portions with 27.6 g. AcNHBr yields 25.9 g. of the ester $\text{BrCH}_2\text{C}(\text{OEt}):\text{CHCO}_2\text{Et}$, light yellow oil, b_{15} 83°, instantly decolorizes KMnO_4 and Br, gives a violet-red color with FeCl_3 ; the position of the Br was established by Hantzsch's thiazole process (*Ann.* 278, 78), aminothiazylacetic ester, *m.* 93°, being obtained. From 7 g. $\text{MeCH}:\text{CH}_2$ dissolved in 28 g. AcNHBr and 150 cc. Et_2O in liquid air, then sealed and allowed to stand 19 days, with frequent shaking, at 15-20°, is obtained 6.4 g. $\text{C}_3\text{H}_5\text{Br}_2$, liquid of characteristic allyl odor, immediately decolorizing KMnO_4 , whose *b. p.* (140.5-1.5°) indicates that it is $\text{CH}_2\text{BrCBr}:\text{CH}_2$. $\text{PhC}:\text{CMe}$ was prepd. by converting $\text{PhCHBrCBrMeCO}_2\text{H}$ by means of cold soda into $\text{PhCHBr}:\text{CHMe}$, treating with the calcd. amt. of alc. KOH, starting the reaction by immersing in a bath at 100°, at once removing from the bath, treating with H_2O and extg. with Et_2O ; 1.8 g. of the $\text{PhC}:\text{CMe}$, b_{15} 70-80°, allowed to stand with 2.1 g. AcNHBr in 10 cc. Et_2O 6 days at 0° and 24 days at room temp. gave 1.9 g. of a yellow liquid, b_{10} 117-27°, with 54.89% Br (calcd. for the di-Br deriv., 58.37): it was, therefore, still contaminated with the original $\text{PhC}:\text{CMe}$ as shown by the fact that 0.41 g. with Br in alc. gave 0.06 g. $\text{PhCBr}_2\text{CMeBr}_2$. Allyl alc. (5.8 g.) and 13.8 g. AcNHBr in 20 cc. Et_2O after 4 days give 3.1 g. of a thick liquid, b_{11} 102-4°, which decolorizes KMnO_4 and Br and whose compn. (*C* 20.88, *H* 3.72, *Br* 68.48%) indicates that it is a mixt. of mono- and dibromoallyl alics. From 13.8 g. AcNHBr and 12.1 g. $\text{CH}_2:\text{CHCH}_2\text{Br}$ in 70 cc. Me_2CO after 12 days is obtained an oil, b_{10} 98-101°, decolorizing KMnO_4 and containing 84.42% Br, which indicates a mixt. of di- and tribromopropylenes. Anhydrous HCO_2H reacts vigorously at 0° with AcNHBr alone or under Et_2O with evolution of gas and sepn. of AcNHBr.HBr, the BrCO_2H decomp. into CO_2 and HBr; the additive power of the compd. and the reactive H indicate that the tautomeric form $\text{C}(\text{OH})_2$ exists in equil. with the anhydrous HCO_2H . From 11.2 g. $\text{AcCH}_2\text{CO}_2\text{Et}$ in 30 cc. Et_2O treated in the course of 3 days with 19.5 g. $\text{C}_4\text{H}_9(\text{CO})_2\text{NBr}$ in 4 portions and allowed to stand

a day longer are obtained $C_6H_4(CO)_2NH$ and a liquid, b_{11} 90–110°, which with $CS(NH_2)_2$ gives aminomethylthiazolecarboxylic ester, m. 174°.

CHAS. A. ROULLER

Interaction of ethylene and sulfur monochloride. FREDERICK G. MANN, WILLIAM J. POPE and RICHARD H. VERNON. Univ. of Cambridge. *J. Chem. Soc.* 119, 634–46 (1921).—Pure S_2Cl_2 may be prepd. by distg. the com. product with S and 1% charcoal. It forms a golden yellow liquid, b. 40°. When heated it dissociates somewhat into SCl_2 and S. The mechanism of the reaction between C_2H_4 and S_2Cl_2 is discussed and evidence adduced to prove that Conant's conception of the reaction is not correct. This concerns the isolation of the hypothetical intermediate product, CH_2ClCH_2SCl . M., P. and V. also show that mustard gas is formed when C_2H_4 is passed into S_2Cl_2 in about half the amt. necessary to form the intermediate product. As a by-product of the reaction β , β -dichlorodiethyl trisulfide, $(CH_2ClCH_2S)_3$, has been isolated, b. 146.5°, m. 27°. On oxidation, it instantly forms β - $C_2H_4ClSO_2H$. Further proof is given that the S is retained in a state of "pseudo solution" in the mustard gas. The crude product, m. 7°, was placed in a small evacuated distg. flask, kept at the temp. of liquid air for 19 days. The product that distd. over was pure mustard gas, m. 12.4°. No evidence of a disulfide was obtained. The absorption of C_2H_4 by S_2Cl_2 and the yield of mustard gas was carefully studied. In all expts. made at 60° with pure S_2Cl_2 and C_2H_4 , with the addition of all foreign agents except alc., the product is a pale yellow liquid which deposits S only after a very considerable time; with an efficient temp. control mustard gas retains the extra S in a state of "pseudo solution" at temps. up to 60°. The yield at this temp. is low (78–79%). Possible impurities in the S_2Cl_2 ($SOCl_2$, SO_2Cl_2 , etc.) did not increase the yield. Alc., however, acts as a positive catalyst in increasing the speed of absorption, and the yield is increased, if the C_2H_4 contains some alc. vapor through the expt., to 98.8%. The S crysts. out on cooling under these conditions. At 30° the reaction was slow and the yield was only 68%. With pure products the speed of interaction is about 1 at 30°, 2.5 at 60°, and 7 at 100°; the corresponding yields are: 70, 80 and 90%. When a small amt. of alc. vapor is present in the C_2H_4 , the speed at 60° increases to 3.5 and the yield is increased to 99%. Attempts to secure Guthrie's disulfide gave only mustard gas.

C. J. WESS

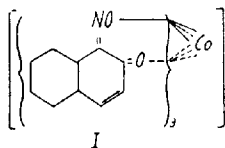
Catalytic hydrogenation of phenylhydrazones. ALPHONSE MAILHE. *Compt. rend.* 172, 1107–10 (1921).—Passed over catalytic Ni at 180° by means of a rapid stream of H_2 , iso-BuCH:NNHPh, b_{11} 183°, gives on fractionation of the product chiefly Me_2CHCH_2CN and $PhNH_2$ (by catalytic decompn.) with small amts. of $C_6H_5NH_2$ and $(C_6H_5)_2NH$ (by hydrogenation). $Me_2CHCH:NNHPh$, b_{12} 167°, behaves similarly, yielding chiefly Me_2CHCN and $PhNH_2$. The secondary reaction becomes the only one for ketone phenylhydrazones, which cannot yield RCN. $Me_2C:NNHPh$ forms (completely only at 220–30°) $PhNH_2$ and Me_2CHNH_2 , with R_2NH and R_3N as by-products. $C_6H_5CMe:NNHPh$, b_{11} 185°, gives similar products, of which $C_6H_5CHMeNH_2$, b. 87°. Also in *Bull. soc. chim.* 29, 417–21 (1921).

BEN H. NICOLET

Organic derivatives of tellurium. IV. Action of ammonia and alkalis upon α -dimethyltelluronium di-iodide. RICHARD HENRY VERNON. Univ. of Cambridge. *J. Chem. Soc.* 119, 687–97 (1921); cf. *C. A.* 14, 1815, 2018.—When dry NH_3 is passed over $TeMe_2I_2$, 6 NH_3 will be taken up in about 2.5 hrs., giving a white semi-fluid mass. Upon passing dry air over this, NH_3 is gradually removed, and after 48 hrs., the compd. $TeMe_2I_2 \cdot 2NH_3$ remains. *Diiodohexamethyltelluronium dioxide*, $TeMe_2(OTeMe_2)_2$, may be prepd. by dilg. a soln. of the α -base from 24 g. of the α -iodide to 150 cc. and boiling with 6 g. powdered α -iodide; it forms minute scales, m. 152° (decompn.). The hydrated dioxiydide m. about 145°, and forms large, transparent, highly refringent hexagonal plates, sometimes 1 mm. thick and containing 0.5 H_2O . When boiled with 10 parts of H_2O , the dioxiydide is hydrolyzed to *diiodotetramethyltelluronium oxide*, $(TeMe_2I)_2O$, yellow powder, m. about 120°. Crystd. from hot H_2O , it forms greenish

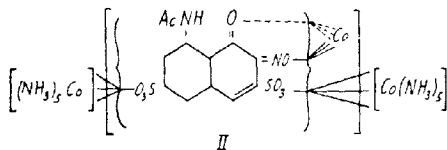
yellow scales, m. 115°. From CHCl_3 it crystals with 0.5 CHCl_3 of crystn., golden yellow cubic crystals, m. about 116°. The action of alkalis or carbonates is similar to that of NH_3 . The following observations of the dihalides are given. α -Dihalides are conveniently prepd. from the α -iodide by changing into the nitrate, driving off the excess of HNO_3 and treating with concd. HCl or HBr . β -Dihalides may be purified by pptg. from soln. (acetone) by CHCl_3 . The α -dinitrate has the formula $\text{TeMe}_2(\text{NO}_3)_2$ and not $\text{TeMe}_2\text{HNO}_3$ as given by Beilstein. The β -dinitrate cannot be crystd., but forms a solid, glassy mass. That the Me groups occupy the *cis*-position is proved by the formation of the β -iodide. I, acting upon the α -iodide, gives the α -iodide *di*-iodide, TeMe_2I_2 , bluish black crystals, not very stable. *Tellurium O-ethylbenzoylacetone trichloride*, $\text{PhC}(\text{OEt})\text{:CHCOCH}_2\text{TeCl}_3$, from TeCl_4 and BzCH_2OMe in CHCl_3 , yellow prismatic tablets, from CHCl_3 , CCl_4 , C_6H_6 , decomp. 140°. This likewise decomp. with KOH , giving pure BzCMe:CHAc . Crystallographic measurements are given of the 2 trichlorides. Se acetylacetone reacts with 2 mols. $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$ with the pptn. of red Se and $\text{O}_2\text{NC}_6\text{H}_4\text{N}_2\text{C[:(C(OH)Me)Ac}$. The filtrate was concd. and extd. with C_6H_6 , giving *1-p-nitrophenyl-3,5-dimethylpyrazole*, $\text{C}_{11}\text{H}_{11}\text{O}_2\text{N}_3$, compact prisms from alc., hair-like orange-yellow needles from dil. AcOH , m. 102°. The insol. portion was *di-p-nitrophenylhydrazineacetylacetone*, $\text{MeC}(\text{NHNHC}_6\text{H}_4\text{NO}_2)_2\text{CH}_2\text{Ac}$, mustard-yellow, m. 218° (decompn.). The action of $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$ and MeCOCH_2Ac gave the last two products together with *acetyl-p-nitrophenylhydrazine*, tough, prismatic golden yellow needles, m. 206°. With $p\text{-BrC}_6\text{H}_4\text{NHNH}_2$, *p-bromobenzeneacetylacetone*, $\text{C}_{11}\text{H}_9\text{O}_2\text{N}_2\text{Br}$, resulted, lustrous lemon-yellow needles, m. 144°. PhNH_2 and Se acetylacetone in alc. react to form *dianilinoacetylacetone*, $\text{C}_{17}\text{H}_{15}\text{O}_2\text{N}_2$, plates, m. 156°. $p\text{-NO}_2\text{C}_6\text{H}_4\text{NH}_2$ gave *p-nitroanilino-ethoxyacetylacetone*, $\text{C}_{15}\text{H}_{15}\text{O}_2\text{N}_2$, pale yellow prisms or plates, m. 141°, and *1-p-nitroanilinoacetylacetone*, $\text{C}_{11}\text{H}_{11}\text{O}_2\text{N}_2$, sepd. by pptn. as a Cu salt, light yellow prisms, m. 152°. *Acetylacetone-p-nitroanil*, $\text{AcCH}_2\text{CMe:NC}_6\text{H}_4\text{NO}_2$, was prepd. from $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$ and AcCH_2COMe , bright yellow needles, m. 145°. The reactions of Se acetylacetone with the 3 classes of amines are tabulated according to the rate. The products are being investigated. C. J. WEST

Researches on coordination and residual affinity. IV. The constitution of simple and complex cobaltic quinoneoxime lakes. GILBERT T. MORGAN AND J. D. MAIN SMITH. *J. Chem. Soc.* 119, 704-16 (1921).—Nitroso- β -naphthol gives rise to a very stable, insol. Co deriv. employed as a means of sepg. Co from Ni and other metals. According to Werner's theory, this Co lake is represented as a coordinated complex in which the metallic atom is implicated in a heterocyclic ring by both its principal and supplementary valencies. This may be represented as in I, in which each quinoneoxime radical, although univalent as regards principal valency, functions nevertheless as a chelate group contributing two associating units to the coordination sphere. Direct evidence has been obtained in support of the view that each chelate quinoneoxime radical is the equiv. of 2 mols. of NH_3 situated in the coordination complex of a cobaltamine such as $[\text{Co.6NH}_3]\text{Cl}_3$. *Hexamminocobaltic 1, 2-naphthoquinone-1-oximate* (hexamminocobaltic 1-nitroso- β -naphthoxide), $(\text{C}_{10}\text{H}_6\text{O}_2\text{N})_2[\text{Co.6NH}_3]$, by treating a soln. of 1.038 g. $\text{C}_{10}\text{H}_6(\text{NO})\text{OH}$ in 6 cc. N



NaOH and 10 cc. H_2O with 0.535 g. $[\text{Co.6NH}_3]\text{Cl}_3$ in 10 cc. H_2O , dark, sage-green ppt. When warmed to 40-50° in H_2O , 98.7% of the theory of NH_3 was evolved, giving the red cobaltic 1,2-naphthoquinone-1-oximate (I). When 2.88 g. 2,7- $\text{C}_{10}\text{H}_6(\text{OH})_2$ is added to 9.35 g. CoCl_2 and 1.66 g. NaNO_2 in 18 cc. H_2O , an 88% yield of *1-cobaltic 7-hydroxy-1,2-naphthoquinone-1-oximate*, $\text{Co}(\text{C}_{10}\text{H}_6\text{O}_2\text{N})_2 \cdot 3\text{H}_2\text{O}$, ppts. as a purple-brown lake with a green reflex, which dissolves in alkali to an olive-black soln., becoming reddish orange on acidifying. 3.1 g. 7- $\text{HOC}_{10}\text{H}_6\text{O:NOH}$, dissolved in excess of NH_4OH and treated with

0.3 g. CoCl_2 and 10 cc. 20% H_2O_2 , gave 7-pentammino-1,7-dicobaltic 7-hydroxy-1,2-naphthoquinone-1-oximate, $[\text{Co}(\text{C}_{10}\text{H}_6\text{O}_2\text{N})_2][\text{Co}(\text{NH}_3)_5 \cdot 5\text{H}_2\text{O}]$, black, which dissolves in aq. NaOH or concd. H_2SO_4 to an olive-green soln. 1-Cobaltic 1,2-naphthoquinone-1-oximate-3-carboxylic acid, $\text{Co}(\text{C}_{11}\text{H}_4\text{O}_4\text{N})_2$, from 380 cc. $\text{Na}_2\text{Co}(\text{NO}_2)_6$ (0.74 g. Co) and 7.05 g. $3\text{-CO}_2\text{HC}_6\text{H}_4\text{OH}$ in 200 cc. abs. alc. After heating 6 hrs., 10 cc. concd. HCl were added. It forms a purplish red lake, sol. in alkalis with an intense reddish yellow color, and in hot AcOH with a deep red color. 1.3 g. $3\text{-CO}_2\text{HC}_6\text{H}_4\text{O}:\text{NOH}$ were added to 2 cc. 5 N NH_4OH and 2 cc. aq. CoCl_2 soln. and the intensely red soln. was warmed with H_2O_2 ; the addition of CoCl_2 , NH_3 and H_2O_2 was repeated and the mixt. again warmed. The product is 3-pentammino-1,3-dicobaltic 1,2-naphthoquinone-1-oximate-3-carboxylate, $[\text{Co}(\text{C}_{11}\text{H}_4\text{O}_4\text{N})_2][\text{Co}(\text{NH}_3)_5]$, brown ppt. On heating with alkalis, it dissolves with evolution of NH_3 . 2-Cobaltic 1,2-naphthoquinone-2-oximate-4-sulfonic acid, prepd. by adding 1.8 g. CoCl_2 and 30 cc. 5 N HCl to a soln. of 60 cc. 2 N NaNO_2 and 25 g. $\text{HOC}_6\text{H}_4\text{SO}_3\text{Na}$ in 200 cc. H_2O , isolated as the β -naphthylamine salt, $\text{Co}(\text{C}_{10}\text{H}_7\text{O}_2\text{N}_2\text{S})_2$, bright red lake. 4-Pentammino-2,4-dicobaltic 1,2-naphthoquinone-2-oximate-4-sulfonate, $[\text{Co}(\text{C}_{10}\text{H}_7\text{NS})_2][\text{Co}(\text{NH}_3)_5]$, by the action of CoCl_2 , NH_3 and H_2O_2 on the oximesulfonic acid, reddish purple powder; boiling alkalis caused the evolution of NH_3 . 2-Cobaltic 6-acetylamino-1,2-naphthoquinone-2-oximate-3-sulfonic acid, $[\text{AcNH}(\text{SO}_3\text{H})\text{C}_{10}\text{H}_6\text{O}:\text{NO}]_2\text{Co}$, from acetyl-J acid and $\text{Na}_2\text{Co}(\text{NO}_2)_6$, isolated as the β -naphthylamine salt, reddish purple powder with bronzy reflex. When boiled 6 hrs. with 2 N NaOH , it lost the Ac group, giving $\text{Co}[\text{SO}_2\text{HC}_6\text{H}_4(\text{NH}_2)\text{O}:\text{NO}]$, a dark brownish gray powder, readily diazotized, and yielding with $\text{C}_{10}\text{H}_7\text{OH}$ an orange dye, with J acid a bluish violet dye and with acetyl-J acid a brick-red dye. 3-Pentammino-2,3-dicobaltic 6-acetylamino-1,2-naphthoquinone-2-oximate-3-sulfonate, $[\text{Co}(\text{C}_{11}\text{H}_6\text{O}_4\text{NS})_2][\text{Co}(\text{NH}_3)_5] \cdot 4\text{H}_2\text{O}$, from cobaltic nitrosoacetyl-J acid, NH_3 , CoCl_2 , and H_2O_2 , reddish purple. 3,6-Dipentammino-2,3,6-tricobaltic 8-acetylamino-1,2-naphthoquinone-2-oximate-3,6-disul-



fate (II), prepd. by treating 12.2 g. acetyl-J salt with a few cc. H_2O_2 , and then with 10 cc. 2 N CoCl_2 , 15 cc. 2 N NaNO_2 and 35 cc. 2 N HCl ; after heating for 15 min. and cooling, 20 cc. 2 N CoCl_2 and a few cc. H_2O_2 were added and the liquid was made alk. with 18 N NH_3 . After 12 hrs. at 0° , a brown ppt. collected. The reddish brown alk. soln. after hydrolysis became intensely bluish purple and probably contained Na 2-cobaltic 8-hydroxy-1,2-naphthoquinone-2-oximate-3,6-disulfonate. 8-Hydroxy-1,2-naphthoquinone-2-oxime 3,6-disulfonic acid, $\text{C}_{10}\text{H}_6\text{O}_4\text{N}_2\text{S}_2 \cdot \text{H}_2\text{O}$, from β - $\text{C}_{10}\text{H}_7\text{NH}_2$ and 1,8-(HO) $\text{C}_{10}\text{H}_4(\text{SO}_3\text{H})_2(3,6)$ reddish purple ppt. 2-Cobaltic 8-hydroxy-1,2-naphthoquinone-2-oximate-3,6-disulfonic acid, isolated as the β -naphthylamine salt, $\text{Co}(\text{C}_{10}\text{H}_6\text{O}_4\text{N}_2\text{S}_2)_2 \cdot 3\text{H}_2\text{O}$. 8-Ammonium 3,6-dipentammino-2,3,6-tricobaltic 8-hydroxy-1,2-naphthoquinone-2-oximate-3,6-disulfonate, $(\text{NH}_4)_2[\text{Co}(\text{C}_{10}\text{H}_6\text{O}_4\text{NS}_2)_2][\text{Co}(\text{NH}_3)_5] \cdot 5\text{H}_2\text{O}$, dark blue powder, giving a deep blue soln. in alkalis which evolves NH_3 in the cold. When treated with 0.1 N HCl in excess, the deep blue color changed to dark red, giving 3,6-dipentammino-2,3,6-tricobaltic 8-hydroxy-1,2-naphthoquinone-2-oximate-3,6-disulfonate, $[\text{Co}(\text{C}_{10}\text{H}_6\text{O}_4\text{NS}_2)_2][\text{Co}(\text{NH}_3)_5] \cdot 5\text{H}_2\text{O}$, purplish red lake. 3,6,8-Tripentammino-2,3,6,8-tetracobaltic 8-hydroxy-1,2-naphthoquinone-2-oximate-3,6-disulfonate, $[\text{Co}(\text{C}_{10}\text{H}_6\text{O}_4\text{NS}_2)_2][\text{Co}(\text{NH}_3)_5]_3 \cdot 5\text{H}_2\text{O}$, from 7.3 g. Na 1,8-(HO) $\text{C}_{10}\text{H}_4(\text{SO}_3\text{H})_2(3,6)$, 20 cc. 2 N CoCl_2 and 15 cc. 5 N NH_4OH , to which were added 15 cc. of 2 N NaNO_2 and 10 cc. 2 N CoCl_2 , the mixt. cooled,

and acidified with glacial AcOH; the mixt. set to a stiff purplish paste. A large excess of NH_4OH was added and the mixt. stirred for 30 min. The ppt. is a bluish black, cryst. powder, insol. in cold aq. alkalis but sol. in the hot with evolution of NH_3 . Two tables are given showing the adjective dyeings with quinoneoxime (nitrosonaphthol) dyes and the color reactions of the naphthols and dihydroxynaphthalenes with $\text{Na}_2\text{Co}(\text{NO}_2)_4$.

C. J. WEST

Organic derivatives of silicon. XXIV. *dl*-Derivatives of silicoethane. FREDERICK S. KIPPING. Univ. College. *J. Chem. Soc.* 119, 647-53(1921).—This is a description of the prepn. of material, which it is hoped will lead to the sepn. of the *dl*- and *i*-forms of substituted Si_2H_6 . *dl*-Diphenyldiethylidipropylsilicoethane, $(\text{SiEtPrPh})_2$, prep'd. by the action of Na upon PhEtPrSiCl in dry C_6H_{10} ; the product was a mixt., boiling over a wide range. Finally a fraction was obtained, b_{100} 265-70°, viscous liquid, with a pleasant aromatic odor, slightly volatile with steam; it is decomp'd. by Br and by concd. H_2SO_4 at 100°, giving C_6H_6 . It appears to be stable towards hot solns. of alkalis. *dl*-Dibenyldiethylidipropylsilicoethane, $[\text{SiEtPr}(\text{C}_6\text{H}_5)]_2$, b_{20} 244-8°, moderately mobile liquid, miscible with most org. solvents, relatively stable towards alkalis. It reacts with concd. H_2SO_4 to give a *disulfonate*, which was isolated as the *brucine salt*, $(\text{SiEtPrCH}_2\text{C}_6\text{H}_4\text{SO}_3\text{H})_2 \cdot 2\text{C}_{22}\text{H}_{36}\text{O}_4\text{N}_2 \cdot 2\text{H}_2\text{O}$, and as the *l*-menthylamine salt, $\text{C}_{10}\text{H}_{18}\text{O}_6\text{Si}_2 \cdot 2\text{C}_{10}\text{H}_{21}\text{N} \cdot 3\text{H}_2\text{O}$, fern-like crystals, m. 220°. It is proposed to sep. these salts into the *dl*- and *i*-acids and then resolve the former.

C. J. WEST

Organic derivatives of thallium. I. Some reactions of thallium-dialkyl halides. ARCHIBALD E. GODDARD. Univ. Birmingham. *J. Chem. Soc.* 119, 672-6(1921).—A soln. of MeMgI from 7.5 g. Mg and 44.4 g. MeI acting upon 19.44 g. TiCl_3 in 75 cc. dry Et_2O , gave 8.5 g. Me_2TlI , plates, did not m. 300°. *Thalliumdimethyl carbonate*, $\text{C}_4\text{H}_{10}\text{O}_2\text{Tl}_2$, from the iodide and Ag_2O , large hexagonal plates, decomp. 255°. The *chromate*, $\text{C}_4\text{H}_{10}\text{O}_2\text{CrTl}_2$, forms brilliant yellow plates, decomp. 255°. The *nitrate*, $\text{C}_4\text{H}_{10}\text{O}_2\text{NTl}_2$, crystals, in shining plates, which do not m. 300°. *Thalliumdiethyl thiocyanate*, $\text{C}_6\text{H}_{10}\text{NSTl}_2$, small plates. *Thalliumdiethyl chromate*, $\text{C}_8\text{H}_{16}\text{O}_2\text{CrTl}_2$, brilliant yellow plates, which decomp. with violent explosion at 193°. *Trichloroacetate*, $\text{C}_2\text{H}_4\text{O}_2\text{Cl}_3\text{Tl}_2$, plates, did not m. 300°. EtMgBr , acting upon the comp'd. TiCl_3Br_3 , quant. reduced it to Ti . MgPrI and TiCl_3 gave TlI , the yield being nearly quant. In the Et series, $\text{Ag}_2\text{Cr}_2\text{O}_7$, $\text{Ag}_2\text{Fe}(\text{CN})_6$ and $\text{Ag}_3\text{Fe}(\text{CN})_6$ failed to give comp'ds.

C. J. WEST

Interaction of acetylene and mercuric chloride. W. J. JENKINS. *J. Chem. Soc.* 119, 747-9(1921).—A much better yield of $\text{ClHgCH}:\text{CHCl}$ (I) is obtained by using C_2H_2 purified by being passed through towers of slaked lime. The comp'd. is much more stable when prep'd. thus. $(\text{CHCl}:\text{CH})_2\text{Hg}$ (II) and $(\text{ClHg})_2\text{CHCHCl}$ could not be made from I. Dry NH_3 , bubbled through I in dry CHCl_3 gave a white ppt. with the compn. and properties of II. The new compound m. 59°.

H. W. POST

Action of hydrogen peroxide on hexamethylenetetramine. C. VON GIRSEWALD AND H. SIEGENS. Lab. Metallbank u. metallurg. Ges. A.-G., Frankfurt a. M. *Ber.* 54B, 490-1(1921).—A repetition of Leulier's work (C. A. 11, 2277), who believed that he had obtained a comp'd. $\text{NH}(\text{CH}_2\text{CH}_2\text{O.OH})_2$ by the action of H_2O_2 on urotropine in strong acid soln., has shown that his N detn. was incorrect and that the substance is really $\text{N}_2(\text{CH}_2\text{O}_2\text{CH}_2)_2$ (C. A. 7, 346).

CHAS. A. RUTTLER

New peroxide compounds of formaldehyde containing nitrogen. C. VON GIRSEWALD AND H. SIEGENS. Lab. Metallbank u. metallurg. Ges. A.-G., Frankfurt a. M. *Ber.* 54B, 492-8(1921); cf. C. A. 9, 77. —Legler (*Ber.* 18, 3343 (1885)) obtained by the action of NH_3 on hexahydroxymethylene peroxide or, according to Nef, diformal peroxide hydrate, $(\text{HOCH}_2\text{O})_2$ (A), the comp'd. $\text{N}_2(\text{CH}_2\text{O}_2\text{CH}_2)_2$ (B), later obtained by v. Baeyer and Villiger from HCHO , $(\text{NH}_4)_2\text{SO}_4$ and 3% H_2O_2 and by von Girssewald from urotropine and H_2O_2 , von G. prep'd. by condensation of urea with A, a product (C) which he designated tetramethylenediperoxidedicarbamide. It has now been

found that $N_2H_4 \cdot H_2SO_4$, HCHO and H_2O_2 under certain conditions yield a substance which, from its compn. and mol. wt., is thought to be a *trimethylene peroxide azine* (D), $CH_2:NR$ ($R = -N \cdot CH_2 \cdot O \cdot O \cdot CH_2$); $EtNH_2$, HCHO and H_2O_2 give an unstable oil believed

to be *dimethyleneperoxideethylamine* (E), EtR . Von G. and H. believe they are justified in assuming the following general condensation reaction between A and bases: $R'NH_2 + A = R'R + 2H_2O$ ($R =$ the same as above), and, therefore, assign to B and C the structures $RCH_2 \cdot O \cdot O \cdot CH_2R$ and $RCONH_2$ with the same 5-membered ring R. This new ring is ruptured more or less easily by acids with formation of HCHO, H_2O_2 and NH_3 or its corresponding derivs. The new peroxides are almost insol. in H_2O and, excepting E, in the usual org. solvents. Like all peroxides, they react sluggishly, their high oxidizing power manifesting itself only after hydrolysis. As substitution products of H_2O_2 they are more or less explosive. While C can be kept unchanged for years, D like B decomps. on long exposure to the air and E begins to decomp. in a few sec. and completely loses its active O in a few days. There seems to be a relationship between the basicity of the N base and the stability of its condensation product with A. D is obtained in 29-g. yield from 52 g. $N_2H_4 \cdot H_2SO_4$ in 1.5 l. of 3% H_2O_2 at 40–50° treated with 200 cc. of formalin in 1 l. of 3% H_2O_2 , filtered after 0.5 hr., washed with H_2O , EtOH and Et_2O and dried *in vacuo* over P_2O_5 ; it is odorless, and, if not heated too high, can be recrystd. from $CHCl_3$, EtOH or PhMe; it is hydrolyzed by dil. mineral acids even in the cold, dissolving in HCl (d. 1.124) or HNO_3 (d. 1.2) and coloring a soln. of Ti sulfate in 2% H_2SO_4 orange in a few min. (H_2O_2 reaction); towards KI it is indifferent as long as it is not hydrolyzed, but in dil. HNO_3 it hydrolyzes and ppts. I which adds to a condensation product of the HCHO with N_2H_4 , forming a brown H_2O -insol. substance, sol. without color in $Na_2S_2O_3$; if the pptd. addition product is warmed, the I oxidizes the N_2H_4 to N and the product redissolves; the I in it is held very loosely and is partly split off by H_2O , so that the substance could not be analyzed. D liberates Cl from concd. HCl, reduces Fehling soln. and $NH_3 \cdot AgNO_3$ on boiling, deflagrates in a flame, explodes with a bright flash when quickly heated in a capillary, also when brought into contact with concd. H_2SO_4 , but is not very sensitive to shock, mol. wt. in freezing $PhNO_2$ 96.4–107.4. Excess of $AgNO_3$ ppts. from the HNO_3 soln. a white unstable amorphous substance which, when washed to complete neutrality, becomes dark brown and gradually black, with sepn. of Ag, when dried in the air; the H_2O suspension on boiling forms a Ag mirror. The mercury compound, $C_6H_5 \cdot N_4 \cdot Hg_2Cl_4$, similarly prepd. with excess of $HgCl_2$, is more stable; it is evidently an addition product, $(CH_2:N_2:CH_2)_2 \cdot 2HgCl_2$, of Pulvermacher's formalazine (*Ber.* 26, 2360 (1893)). To prep. E, 6.75 cc. of 33% $EtNH_2$ and 15 cc. of 40% HCHO are just acidified with about 2.5 cc. AcOH and treated in the cold with 7 cc. perhydrol; the liquid becomes very milky and after a time clears up again and the E seps. as a large drop (about 1 cc.), which is washed with H_2O by shaking and decanting, taken up in EtOH and Et_2O , again pptd. with H_2O , washed and dried in a cold vacuum desiccator over P_2O_5 ; it forms a viscous, colorless, neutral oil, smelling faintly of bleaching powder when fresh but after a while assuming the odor of HCHO and $EtNH_2$, and finally of herring brine, deflagrates in the flame, unattacked by neutral KI, hydrolyzed and dissolved by dil. acids, the solns. pptg. I from KI, at once colors Ti sulfate in 2% H_2SO_4 orange, decompd. only by concd. alkalis or on boiling with evolution of amines, quickly decomps. on standing, changing in a few days to a mobile faintly yellow liquid with herring brine odor and no longer containing any active O.

CHAS. A. ROUILLER

Physical constants of acrolein. CHARLES MOUREU, AUGUSTIN BOUTARIC and CHARLES DUFRAISSE. *J. chim. phys.* 18, 333–47 (1921); cf. C. A. 15, 790.—The physical consts. of acrolein have been measured and the methods employed described by the authors. The consts. obtained are: m. —87–88°, $b_{m, 25}$ 52.15°, $b_{m, 30}$ 52.46°, vapor pressure

in mm. Hg per sq. cm.² at 3.3°, 99.4; 10°, 137.4; 20°, 215.4; 30°, 330.0; 40°, 474.5; 50°, 678.5; 53°, 768.0. (Values are also given expressed in kg. per sq. cm. for temps. between 3° and 137°) d_4 0.86205, d_{20} 0.8389, coeff. exp. $\delta = 0.001318 + 0.0000033t$; $d_4 = 0.86205 / (1 + 0.001318t + 0.0000033t^2)$. Data for δ and d . between 0° and 50° are given. n_D^{16} 1.40475, mol. ref. 16.24 (calcd. 15.65). The authors suggest the proximity of the double bond to the CHO group as a cause for the high value found. Soly. in H₂O, cf. C. A. 15, 790. Sp. heat between 17 and 44°, 0.511, latent heat of vaporization, λ 120.7, L , 6759.2, L/T 20.76, heat of combustion for 1 g. 6960.7 cal., Q (ave.-const. vol.-const. pressure) 390 Cal. (Voisenet, C. A. 9, 1575, gave 393.3), calcd. after Lemoult (*J. chim. phys.* 11, 805) 392 Cal., cond. 10^{-1} 1.55 $\times 10^{-7}$ mhos. Acrolein solns. of BzOH and AcOH acids showed conductivities 1/800 times those of equiv. aq. soln.

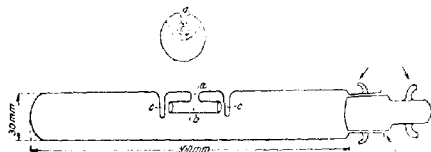
R. L. BROWN

Acrolein. CHARLES MOUREU, *et al.* *Ann. chim.* 15, 158-211(1921). I. Character of spontaneous changes. M. AND CHARLES DUFRAISSE. Cf. C. A. 14, 401. II. Stabilization. (A) M. and D. assert (1) H₂SO₄ favors formation of disacryl in aq. solns. of acrolein, (2) diln. of acrolein with water or alc. increases its stability, (3) all N compds. are inapplicable as stabilizers. (B) M. AND ADOLPHE LÉPAPE.—Cf. C. A. 14, 402. III. Preparation of acrolein. M. AND L.—Cf. C. A. 14, 402. IV. Substances stabilizing against the formation of disacryl. M., D., AND PAUL ROBIN.—Cf. C. A. 14, 740. V. Stabilizing action of phenols. M., D., R., AND JEAN PUGNET.—Cf. C. A. 14, 1303. VI. (A) Physical constants of acrolein. M., AUGUSTIN BOUTARIC, AND D. See preceding abst. (B) Catalytic hydrogenation of acrolein. M. AND R.—Expts. were made in an effort to prepare allyl alc., using Ni and Cu as catalysts (cf. Sabatier and Senderens, *Ann. phys. chim.* [8] 4, 398). The reaction products were EtCHO and PrOH. Considerable decompn. of acrolein occurred with the use of Ni. Ni reduced at 250°, 300° and 350° was used for hydrogenation at 50-200°. The acrolein destroyed varied from 10 to 37.5%, while the EtCHO yield (b. 50-95°) varied from 14 to 64.8%, and the alc. (b. 95-100°) yield from 17.5 to 58%. Cu reduced from the brown oxide at 200° and a com. Cu powder were found more advantageous as a catalyst than Ni. Hydrogenation of acrolein at 200°, using the first Cu, gave a 43% yield of aldehyde, 51.8% of alc. and 5.2% of residue; using the second Cu there was 2.7% of decompn., and 69% of aldehyde, 24.8% of alc. and 3.5% of residue were obtained. The hydrogenation of the CHO group follows that of the double bond. (C) Dichloro and monochloroacrolein. M. AND ETIENNE BOISMENU.— α,β -Dichloropropionaldehyde was prepd. for the first time in a pure state by passing 142 g. Cl₂ in a slow stream into 112 g. of acrolein dissolved in 225 g. CCl₄ cooled in an ice-salt bath. The CCl₄ was removed by distn. at 50° *in vacuo* and the residue on fractionation yielded 187 g. of product b_{14} 48° (74% yield). The 23 g. of the first fraction and the 30 g. of the residue were not refractionated. The pure compd. was a colorless oily liquid, of greater viscosity than water, with a strong odor resembling that of chloral, b_{14} 48°, b_{21} 62°, b_{30} 73°, d_4 1.426, d_{20} 1.400, n_D^{20} 1.4762, mol. ref. 25.59 (calcd. 25.50), Cl₂ (Carius) 56.40 and 56.32% (calcd. 55.90%). The compd. combined with water and alc. with strong heat evolution. Exposed to the light a slight green color developed which deepens. Monochloroacrolein, CH₂:CClCHO, was prepd. by passing a strong current of steam through a boiling soln. of 100 g. of CH₂:ClCHClCHO and 130 g. NaC₂H₃O₂ in 130 g. H₂O until 150 cc. of liquid had collected. The lower layer (49.5 g.) treated with BaCO₃, dried, and fractionated *in vacuo* yielded 19.2 g. of a colorless liquid, strongly lachrymatory and irritating to the mucous membrane, b_{17} 29-31°, d_4 1.222, d_{15} 1.205, d_{20} 1.199, n_D^{20} 1.463, mol. ref. 20.84 (calcd. 20.64), Cl₂ content 39.89% (calcd. 39.22%). The monochloroacrolein is unstable, becoming yellow in 30 min., and brown and very viscous in a few days.

R. L. BROWN

Derivatives of acetylene diacetal. A. WOHL AND K. JASCHINOWSKI. *Techn. Hochschule Danzig. Ber.* 54B, 472-5(1921).—The CH(OEt)₂ grouping in [:CCH-

(OEt)₂ (A) exerts a powerful antireactive influence on the triple bond; A cannot, under the most varied conditions, be made to add H₂O, EtOH, NH₃, HOCl, PhNHNH₂, H₂NCONHNH₂; only with NH₂OH could a reaction be brought about. Hot solns. of 1.93 g. Na in 45 cc. alc. and 5.2 g. NH₂OH.HCl in 65 cc. alc. are brought together, quickly cooled, filtered from the NaCl, heated 24 hrs. on the H₂O bath under a reflux with 5.7 g. A, freed from the alc. at 50°, taken up in Et₂O, washed and dried with Na₂SO₄, giving 4.6 g. of the *addition product* (EtO)₂CHC(NHOH):CHCH(OEt)₂, thick colorless oil, b._{0.5} 109–10°, has a peculiar odor, decolorizes KMnO₄ and Br, reduces NH₃-AgNO₃, but not Fehling soln., gives no cryst. products with AuCl₃ or PtCl₄; 3.2 g. shaken 1 hr.



at 117° with H under 10 atm. in the presence of Pd-charcoal (prepd. from 0.2 g. PdCl₂ in H₂O and a few drops HCl shaken until colorless with 2 g. animal charcoal which is then washed to neutral reaction with H₂O and then a few times with alc.), freed from the alc. at 50° under 12 mm. and taken up in Et₂O gave 1.15 g. of the *compound* (EtO)₂-CHCH(NH₂)CH₂CH(OEt)₂, thick yellow oil, b._{0.5} 107°, reacts distinctly alk., reduces NH₃-AgNO₃ but yields no cryst. products with AuCl₃ or PtCl₄. The reduction was carried out in a tube of the form shown in the accompanying cut and enclosed in a steel bomb tube heated electrically and vigorously shaken in a horizontal direction. Such a tube, 1/8 to 1/3 filled with liquid, can be shaken most vigorously without loss of a single drop of liquid.

CHAS. A. ROULLER

ψ-Thiohydantoin. E. SCHMIDT. *Arch. Pharm.* 258, 226–50 (1920); *J. Chem. Soc.* 120, I, 100.—The elimination of S from *ψ*-thiohydantoin by HgO (cf. Volhard, *Ann.* 166, 383; *Chem. Zentr.* 1873, 218; *Ber.* 7, 1634) is extremely slow, being incomplete even after 4 weeks at 100°. C₂H₂O₄ and NH₃ were the sole products recognized, but guanidine and C₂H₂O₄ are obtained when the reaction is carried out at the ordinary temp. for 4 months in the presence of aq. or alc. NH₃. Since the same products are produced, but more rapidly, from glycoeyamidine under these conditions, the failure to obtain this compd. from *ψ*-thiohydantoin is accounted for. Creatinine similarly gives oxalic acid and methylguanidine. By the action of NH₂HgCl₂ on *ψ*-thiohydantoin, or of NH₃ on its Ag salt, or on the *basic lead salt*, C₂H₂ON₂SPb.PbO, yellow ppt. (cf. Mulder, *l. c.*), the above products were obtained, with a little carbamide. This, however, preponderates when NH₃ acts on a mixt. of the base with Ag₂CO₃, apparently owing to the preliminary formation of hydantoin, since this is easily converted into carbamide and C₂H₂O₄ under the conditions employed. By the action of cold aq. Ba(MnO₄)₂, there resulted carbamide, C₂H₂O₄, H₂SO₄, and a *sulfonic acid*, C₂H₂O₄N₂S, needles [*barium salt*, (C₂H₂O₄N₂S)₂Ba, *silver salt*, leaflets], from which the S atom is eliminated as H₂SO₄ with considerable difficulty by HCl or HNO₃. When thiourea is oxidized by Ba(MnO₄)₂ (cf. Maly, *l. c.*), the yield of carbamide is only moderate, owing to the formation of (NH₄)₂SO₄. *ψ*-Thiohydantoin is converted into its oxime (Maly, *l. c.*; Andreasch, *Monatsh.* 6, 821) by treatment with Na nitroprusside and NaOH, and the same applies to *α*-methylthiohydantoin, but S is easily removed from this compd. in aq. or alc. soln. by the action of HgO, especially in the presence of NH₃. Methyl- and dimethyl-*ψ*-thiohydantoin resemble the parent compd. in their color changes with Na nitroprusside. A *chloroaurate*, C₂H₂ON₂S.HAuCl₄, yellow crystals, sintering at 150–60° but not m. at 250°, is produced when *ψ*-thiohydantoin is treated with AuCl₃ in the presence

of HCl. By soln. in hot HCl, this salt is converted into a second *chloroaurate*, $C_2H_4ON_2S_2AuCl_3$, yellow opaque crystals sintering without m. at 250° . W. O. E.

Synthesis of a second diamide, oxamide, by the oxidation of sugar and ammonia. R. Fosse. *Compt. rend.* 171, 398-400(1920).—F. has shown (*C. A.* 6, 2082) that urea (A) is formed by oxidizing glycerol, H_2CO , or various carbohydrates in the presence of NH_3 . He now shows that sucrose, oxidized cold with $KMnO_4$ in a large excess of NH_3 , yields 5-7% oxamide (B), which is also formed from HCN under similar conditions. The mechanism by which A and B are formed is represented as follows: $H_2CO + NH_3 + O \rightarrow CNH$ (C); C is then oxidized either to $OCNH$ or to $(CN)_2$, which then yield A and B, resp. BEN H. NICOLET

Glyceryl esters. G. B. BONO. *Ann. chim. sci. ind.* 37, 40-5(1921).—Glycerol-monochlorohydrin was prep'd. by boiling glycerol with c.p. HCl, several times distg. off the weak acid and replacing it by concd. acid, or by absorbing HCl gas in boiling glycerol. The chlorohydrin thus prep'd. contained 25-32% combined HCl. With mixed acid the nitro chlorohydrin was obtained, a yellow liquid, d. 1.5408, containing 12-15% N. Glyceryl formate was prep'd. by heating glycerol with oxalic acid to $100-10^\circ$, the primarily formed oxalate decomp. into CO_2 and the formate b.p. $160-70^\circ$. Nitroformate, 16.9-17.25% N. Glyceryl acetate was prep'd. by boiling with 70% AcOH; it contained 3-10% triacetate and no diacetate. It was analyzed by extn. with C_2H_5 , the triacetate being insol. Nitroacetate d. 1.48; 12.48% N. By heating to 170° a mixt. of 2 mols. glycerol and 1 mol. succinic acid, the succinic ester was obtained, containing 40% acid. Nitrated in glacial AcOH, it gave a nitro compd. with 12.63% N. In a similar way were prep'd. the tartaric ester, containing 48% bound acid; nitro compd., 10.8-12.4% N. Citric ester, contains 30% bound acid; nitro compd., 13.25% N.

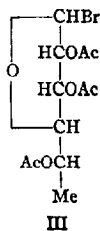
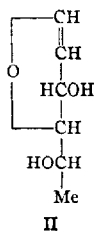
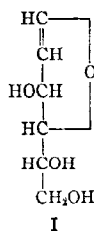
EUGENE FIETZ

The unsaturated reduction products of the sugars and their transformations. I. The glugal problem. MAX BERGMANN AND HERBERT SCHOTTE. Univ. Berlin u. Kaiser-Wilhelm Inst. f. Faserstoffchem., Berlin-Dahlem. *Ber.* 54B, 440-55(1921).—In the course of investigations on the structure of cellulose and other complex carbohydrates, in which were prep'd. a number of transformation products of lower mol. wt. of the simpler sugars, certain observations were made which have led to a considerable modification of the existing views as to the chem. characteristics of Fischer's glugal (A). The structure of triacetylglugal having been established (*C. A.* 14, 3075) it would seem that the free A, obtained from the Ac deriv. by sapon. with $Ba(OH)_2$, should have the corresponding 2,3-dihydrofuran structure I. Such a structure, however, is difficult to reconcile with the pronounced aldehyde properties (reducing action, hydrazone formation, etc.) of A and it seemed worth while to make a few expts. to det. to what extent unsatd. furan derivs. of such a type can give the characteristic aldehyde reactions. Inasmuch as A itself had been obtained only as an ill defined sirup, the corresponding well crystd. reduction product, *rhamnal* (B), of rhamnose was used as the starting point. B is unsatd., adds 2 atoms of halogen and is characterized as a furan deriv. by its sensitiveness towards strong acids and its intense green color reaction with a pine splinter. On oxidation in $AcOEt$ with perbenzoic acid it gives rhamnose, the double bond disappearing and two HO groups taking its place with the production of the reducing atomic grouping of the sugar. There can, therefore, be no doubt that the double bond, as well as the point of union of the furoid O bridge, is at C atom 1, i. e., at that end of the C chain which, after the oxidation to rhamnose, assumes the typical sugar functions. B, therefore, has the structure II and its formation from acetobromorhamnose is easily explained when the latter is assigned the structure III. This 2,3-dihydrofuran deriv. II has now been found not to have most of the typical aldehyde reactions; it is stable towards alkalis and does not reduce Ag or Fehling soln., so that the 2,3-dihydrofuran structure does not suffice to explain the aldehyde-like properties of the A prepn.

which have hitherto been described. A further study of A, which has now been obtained in cryst. form, has shown that, when pure, it reduces neither Ag nor Fehling soln., is not turned brown or resinified by alkalis and does not form hydrazones. One of the reducing impurities present in A prepd. by the old Ba(OH)₂ sapon. method has been isolated and identified as 2-desoxyglucose (= 2-desoxymannose), HOCH₂CH(OH)-CH₂CH(OH).CH₂CH(OH).O (C). Although the above facts leave hardly any doubt

as to the constitution of A, it was further confirmed by its oxidation with perbenzoic acid to mannose, this reaction at the same time affording a new means of passing from glucose to its epimer mannose. From 50 g. III in 500 cc. of 50% AcOH shaken 2.5–3.0 hrs. at –10° to –15° with 100 g. Zn dust, filtered, dild. with 2 vols. H₂O, extd. 4 times with a total of 500 cc. CHCl₃, washed with NaHCO₃, then with H₂O, dried with CaCl₂ and fractionated under 0.3–0.5 mm. there is obtained at a bath temp. of 100–20° 16–8 g. diacetylrammal (D) (there remains a considerable residue consisting chiefly of β-triacetylramnose), [α]_D²⁰ 63.4° in (CHCl₃)₂; 1.1156 g. in CHCl₃ absorbs 0.8212 g. Br (calcd. 0.8329); a part of the Br in the dibromide is very reactive and is replaced by MeO on treatment with Ag₂CO₃ and MeOH, yielding crystals of what is doubtless diacetylmethylramnoside 2-bromohydrin. D is disagreeably bitter, adds Br and Cl but not I, reduces Fehling soln. after alk. hydrolysis, is very sensitive towards acids, by which it is quickly decompd. with darkening, colors a pine splinter in HCl vapors a deep dark green, loses one Ac group but at the same time suffers deep-seated decompn. when boiled with H₂O. When 10 g. D are shaken with 20 g. crystd. Ba(OH)₂ in 100 cc. H₂O, allowed to stand 15 hrs. at 5–10°, satd. with CO₂, filtered at 60°, evapd. *in vacuo*, extd. 3 times with 100 cc. alc., evapd. and distd. under 1–2 mm. at a bath temp. of 120–40° there is obtained 55–65% of rhamnal (II), long pointed needles or flat prisms from C₄H₆, m. 74–5°, [α]_D¹⁸ 45.3° (H₂O), has a cooling bitter taste, is stable towards alkalis and is colored faintly yellow only on boiling but is decompd. by strong acids with deposition of an orange, Et₂O-sol. oil of peculiar odor, is not perceptibly changed by H₂O at 180–90° and is decompd. only at 200°, does not reduce Fehling soln., reddens fuchsin-SO₂ only slowly, at once turns a pine splinter in HCl vapors a dark green, adds Cl, Br and I, gives in AcOEt at 0° with a slight excess of perbenzoic acid about 75% of rhamnose. To prep. pure I, 5 g. of the triacetate is allowed to stand overnight in 10 parts abs. MeOH previously satd. at 0° with NH₃, evapd. *in vacuo*, heated 4–6 hrs. at 100–5° under 0.1–0.3 mm. and rubbed with a glass rod; it forms a cryst. mass deliquescent in the air and in most solvents but can generally be crystd. from ClCH₂CO₂Et, [α]_D¹⁹ –7.2° (H₂O), m. about 60°, seps. in needles or stouter, many-sided formations, has a faintly cooling and bitter taste, reduces Fehling soln. in traces at most, hardly colors hot NH₄-AgNO₃, quickly adds Br, gives on warming with alkalis at most a slight yellow color, forms a vivid green color with a pine splinter in HCl vapors, is quickly decompd. by acids with deposition of green-gray flocks and evolution of a peculiar odor, gradually increases in its reducing power on Fehling soln. when allowed to stand in very dil. HCl, regenerates more than 80% of the triacetate with C₄H₉N and Ac₂O. For its oxidation to mannose it is not necessary to isolate the free I; 3 g. of the triacetate allowed to stand 24 hrs. in 40 cc. MeOH satd. with NH₃, evapd. *in vacuo*, treated directly with the peracid, then with 2 g. PhNHNH₂ in 10 cc. of 50% AcOH gives after 2 hrs. 2.4 g. mannose phenylhydrazone. From 3 g. of a sirupy sample of A prepd. by the original Ba(OH)₂ sapon. method allowed to stand in 15 cc. of 80% alc. 12 hrs. at 15–20° with 4 cc. PhCH₂NPhNH₂, was obtained 1.7 g. of 2-desoxyglucose benzylphenylhydrazone, long lancet-shaped needles from AcOEt, [α]_D¹⁵ 7.7° (MeOH), m. 157–8°, converted by C₄H₉N and Ac₂O into the tetraacetate, stout crystals from C₄H₉-petr. ether, [α]_D²³ 35.35° in (CHCl₃)₂, m. 113–4°. The same hydrazone is obtained in 0.75 g. yield from 1.7 g. of 2-desoxymethylglucoside acetate (which has recently been synthesized from

triacetylglucal through the dibromide, triacetylmethylglucoside 2-bromohydrin and Me glucoside bromohydrin) heated about 40 min. at 100° in 25 cc. of 0.1 *N* HCl, cooled to 0°, shaken with Ag₂CO₃, filtered, freed from Ag with H₂S, concd. as far as possible *in vacuo*, extd. with alc., evapd. to a sirup (which strongly reduces Fehling soln.) and treated in 10 parts alc. with the calcd. amt. of PhCH₂NPhNH₂.



CHAS. A. ROULLER

Synthesis of fatty acid derivatives of the sugars. I. KURT HESS AND ERNST MESSMER. Techn. Hochschule Karlsruhe-Baden. *Ber.* 54B, 499-523(1921).—Recently (*C. A.* 15, 1619) there was developed a view of the structure of cellulose which involved two new principles: (1) It was shown that it is very probable that the glucose mols. are united in a "tannin-like" structure; *e. g.* each of the five HO groups of one glucose mol. is joined in an ether union with another glucose mol., a view which presupposes a similar ability of all the sugar HO groups to condense with long C chains. (2) To explain the production of cellulose with its high mol. wt. it was assumed that these tannin-like structural elements (cellulose) combine through residual affinities according to well defined laws. The development of the cellulose theory led away for the first time from the chain theory for natural substances of high mol. wt. to a comb-like or more or less spherical structure for cellulose, starch and protein. This theory also brings the structure of cellulose nearer to that of the fats, in which there is a massive accumulation of fatty acid chains through the instrumentality of glycerol. The cellulose theory permits of attacking the problem of the structure of cellulose in two ways; by the analytical degradation of cellulose according to the above points of view (more on this will be published elsewhere), and by the synthesis of analogs of cellulose; these synthetic analogs might make it possible to discover properties which are related to those of cellulose, such as soly. in CuO-NH₄OH, swelling in neutral salts, etc. In this connection it was of especial importance to establish any possible differentiation in the ability to condense of the five HO groups of the glucose mol. Fischer showed that in the esterification of glucose with aromatic HO acids all five of the HO groups of glucose have the same ability to condense, but this might be entirely different with aliphatic chains, especially the longer ones. Although the acetylation of sugars by various methods has come to be an important process in sugar chemistry the reaction has thus far not been extended to the homologs of AcOH. H. and M., having found that acetylation can be smoothly effected with AcCl at -15° with formation of α -pentaacetylglucose, tried higher acid chlorides and obtained pentaacyl derivs. and also obtained compds. of the same compn. by an extension of the reaction of Behrend and Roth (*Ann.* 331, 362(1904)), *viz.* acetylation with Ac₂O in the presence of C₂H₅N, to homologous anhydrides. While the optical rotation of the products obtained from the anhydrides indicated that these products were the α -isomers and AcCl, as stated above, also gave the α -compd., the rotations of the compds. obtained from the other acid chlorides not only differed from those obtained from the anhydrides but also from those of the β -forms (which were also prepd.) so that the compds. prepd. from the chlorides are possibly

structural isomers derived from another than the γ -oxide form of glucose. The penta-palmityl-, pentastearyl- and pentaoleylglucoses, octapalmityl- and octastearylsaccharoses and hendecapalmityl- and hendecastearylraffinoses have the properties of ordinary glycerol fats and H. and M. believe it is quite possible that there exist in nature fats in which the alc. constituent is a sugar instead of glycerol and that such fats may have already been discovered but not recognized as such; in the future it might be advisable to det. whether natural fats, under the conditions described below, attack Fehling soln. and, if so, to search for the sugar constituents; cf. in this connection Taylor and Nelson, *C. A.* 14, 2942. In spite of the increased mol. wt. the m. ps. of these sugar fats are not higher, as compared with those of the corresponding free fatty acids, than those of the glycerol fats. The sp. rotation of the products prepd. from the acid anhydrides decreases, apparently according to a definite law, with increasing mol. wt. This regular decrease confirms the view, expressed above, that all these compds. belong to the α series. If the same regular decrease holds for the β -series, it is quite conceivable that the rotation of cellulose, which is made up exclusively of β -glucose mols., might become so small as to fall within the limits of the exptl. error and thus explain its apparent optical inactivity. By assuming a similar ability of NH_2 acids to condense with sugars, the high mol. wt. of proteins can be simply explained without the assumption of giant chains. α -Pentaacetylglucose, m. $111-2^\circ$, is obtained in 3-g. yield from 1.8 g. anhydrous glucose suspended in 10 cc. $\text{C}_6\text{H}_5\text{N}$ (distd. over KOH) and 5 cc. CHCl_3 (distd. over P_2O_5) treated very slowly at -10° to -15° with 4.3 g. AcCl in 5 cc. CHCl_3 , allowed to stand 1-2 hrs. in a freezing mixt., then slowly allowed to rise to room temp. ($15-8^\circ$), dild. after 2-3 days with 30 cc. H_2O , treated with $N \text{ H}_2\text{SO}_4$ extd. with Et_2O , carefully freed from $\text{C}_6\text{H}_5\text{N}$, then from AcOH with $N \text{ NaOH}$, washed with H_2O and dried over KOH . If quinoline is used instead of $\text{C}_6\text{H}_5\text{N}$, evapn. of the Et_2O gives an α -pentaacetylglucose-quinoline addition product, $\text{C}_{24}\text{H}_{38}\text{O}_{11}\text{N}$, as a clear honey-yellow sirup forming on contact with H_2O a crumbly powder, which, desiccator-dried, contains 0.5 mol. H_2O . In the same way from 1.8 g. glucose in 10 cc. each of $\text{C}_6\text{H}_5\text{N}$ and CHCl_3 and 5.9 g. EtCOCl in 5 cc. CHCl_3 is obtained 3.1 g. pentapropionylglucose, b_1 $193-5^\circ$, $[\alpha]_D^{16}$ 80.87° (CHCl_3), quickly reduces boiling Fehling soln. The normal α -pentapropionylglucose, obtained from 1.8 g. glucose allowed to stand 5 days at room temp. with 8.9 g. $(\text{EtCO})_2\text{O}$ and 10 g. $\text{C}_6\text{H}_5\text{N}$, concd. *in vacuo*, treated with 30 cc. $N \text{ H}_2\text{SO}_4$ and extd. with 50 cc. Et_2O , b_1 205° , $[\alpha]_D^{16}$ 61.06° . Pentabutyrylglucose (3.1 g. from 1.8 g. glucose and 5.8 g. PrCOCl), b_1 240° , b_2 $215-20^\circ$, $[\alpha]_D^{16}$ 73.31° . α -Pentabutyrylglucose (4 g. from 1.8 g. glucose and 11.2 g. $(\text{PrCO})_2\text{O}$), $b_{1,2}$ $228-30^\circ$, thick, almost odorless oil, $[\alpha]_D^{16}$ 52.04° . Pentaivalerylglucose (4.3 g. from 1.8 g. glucose and 6.5 g. iso-BuCOCl), b_1 242° , solidifying to long needles, m. about 43° , easily sol. in all solvents and can be crystd. only by adding H_2O to an alc. soln. to incipient turbidity and allowing to cool, $[\alpha]_D^{16}$ 15.19° . α -Pentaivalerylglucose, b_1 242° , $[\alpha]_D^{16}$ 43.68° . α -Pentacapronylglucose, from glucose with AmCOCl or $(\text{AmCO})_2\text{O}$, $b_{p,11}$ $240-5^\circ$, $[\alpha]_D^{16}$ $44.28-44.48^\circ$, reduces Fehling soln. after short boiling with aq. alc. alkali. α -Pentapalmitylglucose, obtained in good yield from 1.8 g. glucose in 20 cc. $\text{C}_6\text{H}_5\text{N}$ at -10° treated with 14 g., palmityl chloride in 20 cc. CHCl_3 , allowed to stand some hrs. at this temp., gradually raised to room temp., and treated with 20 cc. CHCl_3 to assist in redissolving the cryst. mass which is deposited (probably an addition product of the chloride and $\text{C}_6\text{H}_5\text{N}$), gently warmed several hrs. on the H_2O bath, allowed to stand overnight, filtered and crystd. from alc., seps. in snow-white aggregates of microcrystals and after drying over H_2SO_4 forms a friable but soft mass, m. $65-7^\circ$, $[\alpha]_D^{16}$ 34.30° , reduces Fehling soln. after short boiling in alc. with a few drops of 2 $N \text{ NaOH}$, has the same solubilities as tripalmitin, is wholly tasteless; that it is the α -form is indicated by its position on the rotation curve although the synthesis from the anhydride has not been carried out. α -Pentastearylglucose (4.5 g. from 0.9 g. glucose and 10.5 g. stearyl chloride), flocculent,

apparently cryst. mass from alc., m. 70–1°, $[\alpha]_D^{18}$ 34.17°, is tasteless and behaves towards solvents and Fehling soln. like the preceding compd. *β -Monostearylheptaacetylglucose*, from 1.05 g. β -acetobromoglucose in 20 cc. xylene gently warmed on the H₂O bath with 0.95 g. Ag stearate, evapd. *in vacuo*, taken up in Et₂O, freed from any stearic acid with dil. NaOH, evapd. and crystd. from ligroin, rosets, m. 78°. *α -Pentaoleylglucose* (7 g. from 1.8 g. glucose in 20 cc. C₂H₅N and 10 cc. CHCl₃ treated with 15.1 g. oleyl chloride in 10 cc. CHCl₃, allowed to warm up to 15–8°, treated with 10 cc. CHCl₃, heated several hrs. under a reflux on the H₂O bath, cooled, decanted from the oil which seps., evapd. *in vacuo*, taken up in H₂O and Et₂O, freed from C₂H₅N with dil. H₂SO₄, treated with NaCl to break up the emulsion, washed with dil. NaOH, dried with K₂CO₃, evapd., taken up in Et₂O, freed from the last traces of Na oleate by pptn. with petr. ether, evapd. and washed several times with hot abs. alc.), is a brownish, relatively mobile oil, reduces Fehling soln. after boiling with aq. alc. alkali, cannot be distd. under 2–3 mm., $[\alpha]_D^{16}$ 27.51°. *Octapalmitylsaccharose* (5–6 g. from 1.8 g. cane sugar and 12 g. palmityl chloride), pptd. from petr. ether with alc. as a soft granular mass, m. 54–5°, $[\alpha]_D^{16}$ 17.12°. *Octastearylsaccharose* (14 g. from 1.8 g. cane sugar and 17 g. stearyl chloride), spherical microgranules from CHCl₃-EtOH, m. 57°, $[\alpha]_D^{16}$ 16.55°, shows the same solubilities as the preceding compds. and the glycerol fats, reduces Fehling soln. after alk. hydrolysis and inversion with acids. *Heptadecapalmitylraffinose* (12.6 g. from 0.5623 g. anhydrous raffinose and 30.2 g. palmityl chloride), pptd. from petr. ether-Et₂O by EtOH as a yellowish fat-like mass with fatty taste, softens 39°, m. 43°, can be pressed to a waxy mass, $[\alpha]_D^{16}$ 4.15°. *Heptadecastearylraffinose*, m. 63°; by working exclusively at room temp., after initial cooling, were obtained products containing a higher rotating isomer, $[\alpha]_D^{16}$ 27.17° (m. 47°), and 10.02°. *Pentahippurylglucose* (5.9 g. from 6.3 g. hippuryl chloride in 20 cc. CHCl₃ and 1.16 g. glucose in 10 cc. C₂H₅N and 9 cc. CHCl₃ allowed to stand 4 hrs. at –15°, then 1–2 days at room temp., evapd. *in vacuo* at 35°, shaken several times with dil. H₂SO₄ and Et₂O whereby most of the product was deposited on the walls of the funnel as a somewhat resinous mass, repeatedly washed with H₂O and dil. alkali, taken up in alc., evapd. *in vacuo* over H₂SO₄, pptd. from alc. by Et₂O and rubbed with H₂O), forms a yellowish powder with 2H₂O (desiccator-dried), $[\alpha]_D^{16}$ 9.8°.

CHAS. A. ROULLER

New (observations) in the chemistry of the sugars. H. KILLIANT. Univ. Freiburg i. B. *Ber.* 54B, 456–72 (1921).—In the chem. of the sugars there is still one considerable gap; the analogs of glucuronic acid are not known. In order to make the best possible use of a considerable stock of numerous poly-HO acids of the sugar group in his possession, K. undertook to fill this gap by working out practical methods of prepn. As he wished to obtain the aldehyde acids directly the use of H₂O₂ as the oxidizing agent was precluded and only HNO₃ was left. As the result of the numerous expts. it was found that all the substances in question are attacked at room temp. by HNO₃, some even by the ordinary dil. acid (d. 1.2); in some cases where it is desirable to use a dil. acid and it does not react within 24 hrs. it can be activated by adding a small amt. (5% by vol. at most) of fuming acid, the action doubtless depending on the HNO₃ formed according to the equation $2\text{NO}_2 + \text{H}_2\text{O} = \text{HNO}_2 + \text{HNO}_3$. In some cases it was found advantageous to use from the very first an acid rich in HNO₃, prepd. by cooling separately for 0.5 hr. in ice H₂O the fuming acid and the amt. of H₂O necessary for the desired diln. and mixing the two only at the moment when it was desired to use the mixt. In every case it was found essential to keep the temp. at that of the room by using a sufficiently large H₂O bath, not running H₂O or ice. Metasaccharin was used for the first expt. but it was found that acid of d. 1.39 had to be employed and that to bring it into soln. somewhat more acid was required than the amt. calcd. for the formation of the aldehyde; the chief product was trihydroxyadipic acid. This observation and some others led to a change in direction and extension of the original plan; the use of HNO₃

(of the proper concn.) in the manner sketched above makes possible the following: (1) Oxidation of most aldoses to the corresponding monobasic acids. (2) Sepn. of aldoses and ketoses, for sorbose and *d*-fructose (and therefore probably all ketoses) are not attacked by HNO_3 (d. 1.2) at room temp. (3) Simple working up of cane sugar for levulose, as the HNO_3 first inverts the cane sugar and then converts only the *d*-glucose into an acid which can be sep'd. as a Ba salt. (4) A simpler working up of sugar mixts. resulting from the hydrolysis of glucosides. (5) Possibly a new method for studying glucosides. (6) A new, materially simpler method of prepn. of the dibasic acids of the sugar group. (7) An excellent method of prepn. of glyceric and tartronic acids and probably of glyceric aldehyde. (8) The oxidation (and also in many cases the nitration) of all org. substances attacked by HNO_3 of any concn. at room temp. with the formation of very materially purer products and in better yields than by the earlier methods. (1) and (2) make it possible, at least for most practical cases, to do away with the Br oxidation method. As an example of (3) no practical process, free from objections, can be given yet as glucose (see below) behaves abnormally towards HNO_3 , but there is no doubt that an application of the principle will be worked out as soon as certain necessary changes can be established. By (6), much better end results can be obtained than by the older method at 35–60°; the concn. of HNO_3 most satisfactory for any given case can easily be det'd. by test expts. with small amts. of substance. Although in all cases only a very small excess over the calcd. amt. of HNO_3 was used, considerable amts. of higher oxidation products were often obtained; possibly during the unavoidably long reaction time some NO_2 was formed from NO and the O of the air and with H_2O gave $\text{HNO}_2 + \text{HNO}_3$ and in some cases it may prove advantageous to keep out the air. Below are the expts. upon which are based the above statements:

(1) *Aldoses* → *monobasic acids*.—*l*-Arabinose (35.6 g.) and 0.75 vol. (35.6 × 0.75 cc.) of HNO_3 (d. 1.2) in a conical flask in 300 cc. cooling H_2O allowed to stand 4 days, dild. with 4 × 35.6 cc. H_2O , nearly neutralized with CaCO_3 , boiled 0.5 hr., filtered hot, concd. to 3 × 35.6 cc., seeded with Ca *l*-arabinate and washed with 30, 50 and 95% alc. gave 37.2% of the salt; alc. pptd. 22% more from the mother liquors. *l*-Xylose (1.578 g.) and 0.75 vol. HNO_3 (d. 1.2) gave after 5 days somewhat more than 1 g. of the salt $\text{C}_5\text{H}_7\text{O}_6\text{CdBr} \cdot 4\text{H}_2\text{O}$. Rhamnose (10.06 g.) + 0.6 vol. HNO_3 (d. 1.25) in 150 cc. cooling H_2O did not react in 16 hrs. but reaction set in soon after addition of 1 cc. fuming HNO_3 (d. 1.54) and after 10 days yielded the non-crystallizable Ca rhamnonate, from which the lactone was obtained in good yield. *d*-Galactose (5.456 g.) did not react after 32 hrs. with 2 vols. HNO_3 (d. 1.2) in 120 cc. cooling H_2O , but when the latter was removed a clear soln. resulted overnight and NO_2 was evolved, and after 14 days 0.5152 g. mucic acid had sep'd.; the mother liquors yielded Ca *d*-galactonate in abundance. *d*-Glucose (100 g.) + 0.8 vol. HNO_3 (d. 1.2) in a large conical flask in 600 cc. cooling H_2O reacted distinctly after 24 hrs., the reaction becoming feeble only after 8 days; on the 11th day the soln. was dild. with H_2O and boiled with CaCO_3 but the soln. at once became a deep dark color and alc. pptd. a most uninviting (almost black) salt; consequently there must have been formed in this case a considerable amt. of a very labile oxidation product; in a 2nd expt., therefore, after 14 days the soln. was dild. to 250 cc. and treated cold with CaCO_3 in small portions until neutral (2–3 days), giving 10.1 g. of what is apparently Ca glucuronate which, after being freed from a little admixed CaCO_3 by being allowed to stand 2.5 hrs. with 5 vols. of 10% AcOH , sep'd. from H_2O in crusts of stout sharp-angled crystals with $2\text{H}_2\text{O}$; the mother liquors, on treatment with several vols. of alc., yield a ppt. which, freed of $\text{Ca}(\text{NO}_3)_2$ and unchanged sugar by continued washing with alc., gives on shaking with soda a Na salt which strongly reduces Fehling soln. In connection with this process two things are worthy of note: (a) Only 1.333 atom O per mol. glucose was used instead of the 2 atoms calcd. for the reaction glucose → glucuronic acid; hence the regeneration of HNO_3 mentioned above must play a ma-

terial part in this case. (b) The glucuronic acid itself must be very stable towards HNO_3 (d. 1.2) at room temp. for the Ca salt pptd. by alc. (see above) contains only a minimal amt. of Ca saccharate. (2) *Ketoses remain unchanged*.—Neither *d*-fructose nor sorbose is attacked by 0.8 vol. HNO_3 (d. 1.2) after several days at room temp. (3), (4) and (5). The expts. under these sections have not been concluded; one of the difficulties under (3) and (4) is the "abnormal" behavior, described above, of glucose, giving a very labile oxidation product, apparently glucuronic acid. (6) Ca trihydroxyadipate is obtained in 42% yield from 14.2 g. metasaccharin and 10 cc. HNO_3 (d. 1.4) at 22° allowed to stand, without cooling H_2O , 5 days, dild. with 70 cc. H_2O , almost neutralized by gradual addition of 1:10 NaOH, then treated with $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ soln. (1:2) until the $(\text{CO}_2)_2\text{Ca}$ is just pptd. (about 3 cc., corresponding to a 7.5% conversion of the sugar into $(\text{CO}_2)_2\text{Ca}$), filtered and treated with more CaCl_2 (1 mol. for every 2 mols. of NaOH used). Similarly 6.7 g. arabinosecarboxylic acid and 0.6 vol. HNO_3 (d. 1.39) after 10 days yield 52.8% metasaccharic dilactone. (7) From 100 g. of 90% glycerol and 1.6 vol. HNO_3 (d. 1.268) in 1 l. cooling H_2O and after 12 hrs. (during which there was no reaction) 5 cc. fuming acid (d. 1.54) is obtained after 9–10 days about 45% of Ca glycerate; if the Ca of this salt is removed with $(\text{CO}_2)_2\text{H}$ and the filtrate evapd. at 35° to a thick sirup (46 g., containing about 40% of the acid) which is then treated in 250 cc. cooling H_2O with 28 cc. fuming HNO_3 (d. 1.54, previously cooled 15 min. with ice), removed from the bath after 18 hrs. and allowed to stand 8 days, it gives 7.8% oxalic and 22.36% tartronic acids as the Ca salts; the free tartronic acid can be extd. almost quant. by shaking 1 part of the air-dried salt and 2 vols. of 20% HCl 8 times with 2–3 vols. Et_2O and seps. on evapn. of the Et_2O at $30\text{--}5^\circ$ in tables; a neutral soln. (1:35) of an alkali salt treated with the calcd. amt. of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ (1:4) gives a voluminous ppt. of the Ba salt, which quickly changes into short columns or needles; the air-dried acid stirred with 1 mol. of 0.5 *N* NaOH dissolves at first but the mono-Na salt at once begins to sep., mostly in long needles or columns; if 0.2 instead of 0.5 *N* NaOH is used the sepn. does not begin at once, to be sure, but a considerable amt. of the salt is deposited before the soln. has undergone any appreciable concn. When 104 g. of 90% glycerol and 0.7 vol. 42% HNO_3 in 900 cc. cooling H_2O are treated with 5 cc. fuming HNO_3 (d. 1.54), dild. to 300 cc. after 10 days, slowly treated with slightly more than the calcd. amt. of BaCO_3 , vigorously shaken some hrs., dild. with an equal vol. of 95% alc. (which ppts. chiefly $\text{Ba}(\text{NO}_3)_2$), filtered after 24 hrs., treated with 400 cc. more 95% alc., filtered from the ppt. (which consists mostly of Ba glycerate) and concd. at 35° there is obtained a sirup which slowly but powerfully reacts with fuchsin- SO_2 , yields glycerosazone in abundance and, when freed as completely as possible from unchanged glycerol by treatment with 1 vol. abs. alc. and 2 vols. Et_2O , gives a soln. strongly reducing Fehling soln. even in the cold and leaving on evapn. a sirup which forms an oxime which does not cryst. after standing 14 days over H_2SO_4 ; it is, therefore, highly probable that the oxidation product contained $\text{HOCH}_2\text{CH}(\text{OH})\text{CHO}$ and not $\text{CO}(\text{CH}_2\text{OH})_2$. (8) *Appendix*.—Since castor oil consists chiefly of the triglyceride of ricinolic acid for which Goldsobel (*Ber.* 27, 3121 (1894)) gives the structure $\text{Me}(\text{CH}_2)_7\text{CH}(\text{OH})\text{CH}_2\text{CH}:\text{CH}(\text{CH}_2)_7\text{CO}_2\text{H}$, it should yield, when oxidized, 3 mols. azelaic acid or, on more vigorous treatment, pimelic rather than suberic acid, as reported by Day, Kon and Stevenson (*C. A.* 14, 2622). When 50 g. of the oil and 1 vol. AcOH are treated without shaking with 1.5 vols. of a mixt. of 2 vols. of HNO_3 (d. 1.39) and 1 vol. fuming acid, (d. 1.54) in 600 cc. cooling H_2O , removed from the bath after 4 days, then shaken frequently in the course of 6 days, slowly treated with enough NaOH (1:5) to neutralize 0.5 of the HNO_3 used and extd. with Et_2O there is obtained 28.5% (based on the wt. of oil used) of pure white solid crude acids, sepd. by crystn. from H_2O into about 50% of azelaic acid and 33% of an acid m. 138° and, mixed with Kahlbaum suberic acid, m. 137° , equiv. wt. (by titration with KOH and phenolphthalein) 90.7; nevertheless there are serious doubts as to the identity of this product

with suberic acid, for the titrated soln. does not form a ppt. with CaCl_2 until after several hrs. Cinnamic and benzoic acids, treated as above with HNO_3 , give $m\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ as the chief product.

CHAS. A. ROULLER

Glucosides. VIII. Glycyrrhizin. P. KARRER, W. KARRER AND J. C. CHAO. *Helvetica Chim. Acta* 4, 100–12 (1921).—In testing the K salt of glycyrrhizic acid for N in the course of carrying out combustions, a certain amt. of a gas was obtained which might be mistaken for that element, which proved to be CH_4 . This salt, therefore, yields on heating about 7% pure methane. A similar behavior was observed also in the case of the free acid, likewise of the aglucone, glycyrrhetic acid. By the prepn. of the methyl ester (needles, m. 241°), ethyl ester (needles m. $246\text{--}8^\circ$), diacetyl compound of glycyrrhetic acid, the formula for this acid, $\text{C}_{42}\text{H}_{60}\text{O}_{12}(\text{OH})_2\text{CO}_2\text{H}$, is materially strengthened. In a degradation attempt with HI and PH_4I in AcOH , glycyrrhetic acid was made to yield by the application of heat a new cryst. compd. m. $298\text{--}300^\circ$, desoxyglycyrrhetin (diacetyl compound m. 260°).

W. O. E.

The roots of Rheum emodi Webb. J. J. HOLMSTROM. Helsingfors and Bern. *Schweiz. Apoth. Ztg.* 59, 169–75, 183–9 (1921).—The dried root (10 kg.) was extd. with 95% EtOH 6 or 7 times. A ppt. from the first portions of the ext. contained starch, mucus and sugar, with but traces of anthraquinones. The residue of the root gave to hot H_2O only small amts. of anthraquinones. The EtOH ext. became cloudy after 2 weeks and soon yielded a thick mass of crystals, which after treatment with warm H_2O , small amts. EtOH , benzene and CHCl_3 in succession, were dissolved in 70% EtOH and several times recrystd., the last time from 20% EtOH . They were then decolorized with animal charcoal in 10% AcOH , and finally recrystd. from boiling H_2O . The colorless crystals, m. $230\text{--}1^\circ$, were identified as the glucoside rhaponticin $\text{C}_{27}\text{H}_{42}\text{O}_{13}$ discovered by Hornemann (1822). One OMe was present. Hexaacetyl-rhaponticin crystd. as colorless needles, m. 125° . Hesse (*C. A.* 2, 2282) and Cristofolletti and Tschirch (*Arch. Pharm.* 243, 443 (1905)) each found it to m. 138° , but regarded it as a hexa- and a di-Ac deriv. resp. It is insol. in petr. ether, alkali carbonates, KOH , NaOH , NH_4OH , cold MeOH or EtOH , easily sol. in pyridine, CHCl_3 , PhMe , C_6H_6 , acetone, glacial AcOH , Et_2O , and xylene, sol. in warm EtOH and MeOH . It is colorless with FeCl_3 , yellow with chloride of lime soln., blood-red (changing to orange), with concd. H_2SO_4 , and yellow with concd. HNO_3 . It can be hydrolyzed by KOH or NaOH and rhaponticin repptd. Hexabenzoyl-rhaponticin $\text{C}_{27}\text{H}_{18}(\text{C}_6\text{H}_5\text{CO})_6\text{O}_6$, prepd. by benzoylation in presence of NaOH , could not be crystd. Rhapontigenin and *D*-glucose (osazone, m. 295°) were obtained by the hydrolysis of rhaponticin. Rhapontigenin, recrystd. from MeOH , then from dil. AcOH , glistening, colorless needles, m. $180\text{--}1^\circ$, $\text{C}_{27}\text{H}_{42}(\text{OMe})_6\text{O}_6$, easily sol. in acetone, Et_2O , MeOH , EtOH , AcOEt , glacial AcOH , pyridine; somewhat sol. in warm H_2O , insol. in C_6H_6 , CHCl_3 , petr. ether, pptd. from EtOH by petr. ether. The EtOH soln. becomes white with $\text{Pb}(\text{OAc})_2$, brown-black with CrO_3 , green with FeCl_3 , brown with KMnO_4 , and orange-yellow with Ca hypochlorite. It is colorless in alkalies and alkali carbonates, as well as in NH_4OH , but becomes brown later. It is sol. in concd. H_2SO_4 with an orange-red color, rose on diln. With more H_2O , it gives a floccy ppt. In NaOH it gives a green color with NaHSO_3 . Conc. HNO_3 gives a brown color, HCl rose, and Millon's reagent an orange-yellow ppt. Rhaponticin could not be hydrolyzed by enzymes. Colorless prisms of tetraacetyl-rhapontigenin, $\text{C}_{16}\text{H}_{11}\text{Ac}_4\text{O}_6$, m. 112° , crystd. from glacial AcOH , then from MeOH , were sol. in acetone, pyridine, CHCl_3 , PhMe , C_6H_6 , glacial AcOH , AcOEt , xylene; difficultly sol. in cold MeOH , insol. in EtOH , petr. ether, alkali carbonates and NH_4OH . The MeOH soln. is colored red by chloride of lime; the solid becomes yellow with concd. HNO_3 , orange-red with concd. H_2SO_4 , brown-black with fuming HNO_3 . Millon's reagent does not react. Tetra-benzoyl-rhapontigenin, $\text{C}_{16}\text{H}_{11}\text{Bz}_4\text{O}_6$, m. 147° , recrystd. from acetone, is easily sol. in acetone, pyridine, CHCl_3 , PhMe , C_6H_6 , Et_2O , and AcOEt , difficultly sol. in dil. EtOH ,

MeOH, NH₄OH, glacial AcOH, petr. ether, alkalies, and alkali carbonates. The acetone soln. gives a white floccy ppt. with chloride of lime; the prepn. is colored light yellow by concd. H₂SO₄, brown-black with fuming HNO₃, and gives no reaction with concd. HCl or Millon's reagent, or concd. HNO₃. The EtOH ext. of the drug, after removal of most of the rhaponticin, yielded to Et₂O a yellow ext. from which chrysophanic acid sepd. on distn. of the Et₂O. More of a yellow substance remained in the ext. after the Et₂O treatment. The dried ext., dissolved in EtOH and a little H₂O, was treated in a tubulated retort with C₆H₆ vapor passed into the retort through a bent glass tube extending through the tubulure nearly to the bottom. Yellow C₆H₆ condensed in the receiver. Traces of rhaponticin crystd. from the C₆H₆, and on distn. chrysophanic acid and phytosterol (which held the yellow substance in soln.) were left. The material in the retort (dried after removal of C₆H₆) held another yellow substance which was extd. by boiling abs. EtOH, and pptd. by Et₂O as golden yellow crystals, m. 211°, (X), C, 59.36%, H, 4.98%; calcd. for C₂₂H₂₂O₁₀, C, 59.19%, H, 4.93%. They are sol. in EtOH, Et₂O, CHCl₃, and C₆H₆, insol. in petr. ether, NH₄OH, dil. alkalies and alkali carbonates, sol. in concd. H₂SO₄ with a red color, in concd. HNO₃ with yellow color, become red with NaOH and appear to be rheochrysin, shown by Gilson to m. 204°. The yellow substance (not X), m. 194°, was chrysophanic acid, C₁₃H₁₀O₄, free from OMe. *Chrysophanhydroanthrone*, m. 205°, small yellow leaves, sol. in EtOH, glacial AcOH, NaOH, KOH, was obtained during the Zeisel detn. *Diacetylchrysophanic acid*, C₁₅H₈Ac₂O₄, prepd. by the Liebermann-Hormann method, m. 205°; Oesterle gives 208°. The NaOH solns. employed in the purification of the chrysophanic acid gave a dark brown ppt. on the addition of dil. HCl. This gave to Et₂O a material, which on CHCl₃ extn. gave crystals resembling frangula-emodin, but which were lighter in color, m. 248°. One analysis gave C, 66.67%, H, 3.9%; calcd. for C₁₄H₁₀O₄, C, 66.66%, H, 3.7%. The yield from 10 kg. root was only 0.06 g. *Rheum emodi* belongs to the rhapontic group, and must not be substituted for true rhubarb.

F. F. HEYROTH

Derivatives of *m*-xylene. SYDNEY A. PEARMAN. Univ. Birmingham. *J. Chem. Soc.* 119, 717-21(1921).—This study was made to det. whether derivs. of *m*-xylene were likely to be of use as color-producing intermediates. *6-Nitro-m-xylene-4-azo-resorcinol*, C₁₄H₁₂O₄N₂, from 3.3 g. of the xylidine, which after diazotizing, was treated with 2.2 g. resorcinol, small, light red iridescent tabular crystals from glacial AcOH, char, 230°, intumesce 248°. This dyed chromed wool in full orange shades. *Diacetate* C₁₈H₁₇O₆N₂, lustrous orange-red flakes from alc., m. 145-7°. *6-Nitro-m-xylene-4-azo-salicylic acid*, C₁₅H₁₂O₅N₂, by adding the diazo soln. from 5 g. xylidine to a dil. NaOH soln. of 4.6 g. HOC₆H₄CO₂H, brick-red amorphous ppt., decomp. 220-4°. Conc'd. H₂SO₄ develops an orange-yellow color with the 1st and a deep orange shade with the 2nd comp'd. The latter dyes chromed wool in deep yellow shades. *Acetyl-4,6-diamino-m-xylene*, C₁₀H₁₁ON₂, by reducing 25 g. acetyl-6-nitro-*m*-4-xylidine with 50 g. Zn in 350 cc. 50% alc. and 5 g. NH₄Cl, stout needles with bronzy reflex when moist, matted needles from C₆H₆, m. 164-6°. *6-Acetylamino-m-xylene-4-azo-β-naphthol*, matted, scarlet needles from glacial AcOH, does not m. 300°. Conc'd. H₂SO₄ gives a magenta color. *6-Amino-5-methylindazole*, C₈H₈N₂, by reducing the corresponding NO₂ deriv. with FeSO₄ and NH₄OH, hexagonal plates or lustrous needles, m. 241-2°. *Di-p-toluene-sulfonyl-4,6-diamino-m-xylene*, C₂₇H₂₇O₄N₂S₂, small needles, m. 221-2°. The condensation product obtained with HCHO and the diamine is a complex substance. One product is a base, C₁₅H₁₂N₂, needles resembling asbestos fibers, m. 223.5-6°, whose sulfate forms clusters of minute hairy needles from alc., decomp. 248°. *Acetate*, C₁₇H₁₄ON₂, clusters of prisms.

C. J. WEST

Optical investigations on the constitution of aromatic amines. H. LAY AND G. PFELFFER. Univ. Münster. *Ber.* 54B, 363-78(1921).—Some time ago (C. A. 13, 1470) it was found that in certain unsat'd. compds. with a conjugated system the change

$\text{PhCH:CHX} \longrightarrow \text{PhCMe:CHX}$ ($\text{X} = \text{Ph}, \text{CO}_2\text{H}, \text{H}, \text{etc.}$) is accompanied by a flattening of the absorption band and a shifting of the absorption towards the shorter wave lengths, *i. e.*, that the Me has a hypsochromic effect. A similar influence is exerted by the otherwise typically auxochromic alkoxy groups when introduced into the α -position in styrene. At first it seemed that such pronounced hypsochromic effects appeared exclusively in unsatd. systems with open chains but, as shown in the present work, they also appear in certain derivs. of C_6H_6 , especially in PhNMe_2 (A) after the introduction of certain groups. As these *o*-substituted dimethylanilines also show anomalies in their other physical consts. and in many cases in their chem. reactions it is possible to follow a series of relationships which may possibly be adapted to furnishing a deeper insight into the constitution of C_6H_6 . Starting with A, with selective absorption at $1/\lambda$ 3400 and 4000, the di-*i*-t, di-*Pr* and di-*Am* homologs were found to have similar absorption curves, with a slight shifting towards the longer wave lengths with increasing mol. wt. If, however, a Me group is introduced in the *p*-position in A there is a considerable shifting towards the red (about 90 units), although otherwise the curve is quite similar to that of A. *o*- $\text{MeC}_6\text{H}_4\text{NMe}_2$, on the other hand, is considerably more transparent than A and the character of its absorption curve is quite different; there is but an indication of the first band at about 3500. *m*- $\text{MeC}_6\text{H}_4\text{NMe}_2$ closely resembles A and the *p*-compd. 2,4- $\text{Me}_2\text{C}_6\text{H}_3\text{NMe}_2$ shows an anomaly, there being but an indication of the band between 3400 and 3500 and the band in the shorter wave length region being but indistinctly developed. This anomaly is even more pronounced in 2,6- $\text{Me}_2\text{C}_6\text{H}_3\text{NMe}_2$; the absorption is shifted towards the ultraviolet and changed in character; in the neighborhood of 3500 an indication of selective absorption can be detected and the short-wave band has disappeared. On the other hand, 3,4- $\text{Me}_2\text{C}_6\text{H}_3\text{NMe}_2$, with no Me groups in the *o*-position to the NMe_2 , is normal and shows an absorption entirely similar to that of A. The same differences are found in *p*- and *o*- $\text{ClC}_6\text{H}_4\text{NMe}_2$, the bands for the *o*-compd. being at 3550 and 4000 and those for the *p*-compd., whose absorption is similar to that of A, being at 3180 and 3800. Analogous differences are also shown by *o*- and *p*- $\text{MeOCC}_6\text{H}_4\text{NMe}_2$, the former having a narrow band at about 3550 and another near 4000, the latter two bands at 3200 and 4100. By salt formation the disturbing influence introduced into the mol. by the NMe_2 group is destroyed; this change of the unsatd. NMe_2 group into the satd. $\text{Me}_2\text{N}\cdots\text{H}$ complex is accompanied by a marked shifting of the absorption towards the shorter wave lengths. The HCl salts absorb in the same region as the hydrocarbons and in them the normal bathochromic effects of Me find expression. An exception to the observations hitherto made is found in the *N*-dimethylnitroanilines; corresponding to the strongly chromophoric character of the substituent, there is in this case intense absorption in the visible spectrum, which is shifted further towards the longer wave lengths in the case of the *o*-compd. than in that of its isomers; in 0.1 *M* alc. soln. and 10 mm. depth the continuous absorption of the *o*-compd. begins at about 1980, that of the isomers at 2200; the heads of the bands lie at 2200 (8 mm., 0.001 *M*) and 2580 (1.6 mm., 0.001 *M*), resp.; moreover the *o*-compd. also shows a band at about 4050 (1.2 mm., 0.001 *M*). No systematic investigations on the absorption of isomeric C_6H_4 derivs. are available for a detn. of the influence of the position, in and of itself, of the substituents on the ring but from what data are at hand this does not seem to make great differences; the very considerable deviations found in the case of the *N*-dimethylanilines justify the assumption that the abnormal optical effect in *o*- $\text{MeC}_6\text{H}_4\text{NMe}_2$ is due to a material change in the structure of the aromatic nucleus as compared with A; as will be shown later this cannot be due to the base-forming property of the NMe_2 group suffering a material change in *o*- $\text{MeC}_6\text{H}_4\text{NMe}_2$, for the base derived from this compd. is even stronger than that from A. A support for the view that the introduction of *o*-substituents into A produces a change in the gap unions (*Lückenbindungen*) of the C_6H_6 nucleus is found in the formation of complexes

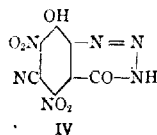
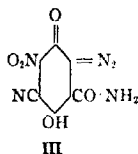
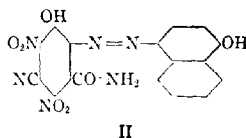
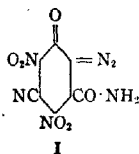
by tertiary amines with highly nitrated compds. such as $C_6H_5(NO_2)_3$ (B). A forms a deep violet compd., A.B, sol. with partial dissociation in $CHCl_3$ with red-violet color. The tendency to the formation of such complexes is materially less in *o*-derivs. of A and the products are lighter in color, and the absorption spectra of the isomeric complexes also differ characteristically; while that of *p*- $MeC_6H_4NMe_2$ shows a distinct band in the green and is similar to that of A, that of *o*- $MeC_6H_4NMe_2$ absorbs continuously under the same conditions (0.02 M soln. in $CHCl_3$). Parallel with the anomalous absorptive behavior, the *o*-substituted anilines show anomalies in mol. refraction and dispersion, as also in b. p., d. and n . L. and P. offer the following tentative explanation of these anomalies; C_6H_6 is not a fully neutral conjugated system but at every C atom there is still a residuum of affinity the amt. of which can be changed, generally increased, by substituents. After the introduction of specially reactive, unsatd. groups like NMe_2 the amts. of partial valence become greater; at the same time the gap unions pass into a more reactive state somewhat resembling olefinic unions, a change manifesting itself in the complete change of the absorption curve of the hydrocarbon and in the considerable shifting of the absorption towards the red, as also in a marked increase in the refraction and dispersion values. Substituents in the *o*-position can partially overcome this reactivity of the gap unions so that the amts. of partial valence at the individual C atoms again decrease. This last effect is very probably conditioned by the spatial extension of the substituents, for it is not manifested in the *m*- and *p*-compds. The condition of the C_6H_6 gap unions in *o*- $MeC_6H_4NMe_2$ is in a certain sense comparable to that in a C_6H_6 deriv. with indifferent substituents. Of importance for the question of the constitution of C_6H_6 , moreover, is the discovery that these optical anomalies appear most markedly in the (tertiary) phenyldialkylamines; an indication of these peculiar behaviors is afforded by a consideration of Brühl's values for the at. refraction of amine N, which increases with the number of C atoms attached directly to the N and is greater in the aliphatic-aromatic than in the purely aliphatic amines; the high value for the refraction of the N in compds. of the type $ArN(Alk)_2$ suggests that these values represent not only the characteristic value for the N but also exaltations for the gap unions of the C_6H_6 nucleus. Finally, a comparison of the influence of an *o*-Me group in primary, sec. and tert. amines shows that whereas in *o*- $MeC_6H_4NHMe_2$ there is a depression of the refraction, *o*- $MeC_6H_4NH_2$ and *o*- MeC_6H_4NHMe have approx. normal refractions. The absorption relations are somewhat more complicated; in the two changes $PhNH_2 \rightarrow o-MeC_6H_4NH_2$ and $PhNHMe \rightarrow o-MeC_6H_4NHMe$ the continuous absorption is shifted 25-50 units towards the shorter wave lengths but the spectra of all four are very similar and the *o*-Me group exerts no such influence as in the case of the tert. amines. The tert. amines used in this work were prepd. or purified in 2 ways: the primary amine was methylated with MeI to the quaternary salt, and the base liberated with Ag_2O and distd., or the tert. amine, obtained by other means and contaminated with the primary and sec. bases, was purified in the usual way with Ac_2O . The addition compds. with B were prepd. from equimol. amts. of the components in $CHCl_3$ allowed to evap. slowly in tall crystg. dishes. The values for n given below are for α , D, β and γ , resp. $Ph-NMe_2$, b_{712} 194-4.6°, d_{20}^{20} 0.9563, n 1.55189, 1.55869, 1.57654, 1.59333. *o*- $MeC_6H_4NMe_2$, b_{712} 184.6-5.4°, d. 0.9287, n 1.52032, 1.52548, 1.53872, 1.55033; *trinitrobenzene compound*, yellow-brown rhombic tables, m. 113°, sol. in $CHCl_3$ with red-yellow color. *o*- MeC_6H_4NHMe , b. 207-8°, d. 0.9789, n 1.55854, 1.56488, 1.58149, ——. *m*- $MeC_6H_4NMe_2$, b_{712} 211.5-2.5°, d. 0.9410, n 1.54288, 1.54917, 1.56582, 1.58150; *trinitrobenzene compound*, prisms with black luster, sol. in $CHCl_3$ with red-brown color. *p*- $MeC_6H_4NMe_2$, b. 209.6-10.6°, d. 0.9366, n 1.54022, 1.54903, 1.56357, 1.57969; *trinitrobenzene compound*, long black-violet needles forming violet-red solns. *2,6-Me_2C_6H_3NH_2*, b_{712} 215.8-6.4°, d. 0.9796, n 1.55524, 1.56116, 1.57631, 1.59026, *2,6-Me_2C_6H_3NMe_2*, b_{712} 195-6.2°, d. 0.9147, n 1.50859, 1.51310, 1.52488, 1.53649; *trinitrobenzene compound*,

scarlet tablets, m. 108°, sol. in CHCl_3 with light yellow color. 2,4- $\text{Me}_2\text{C}_6\text{H}_3\text{NMe}_2$, b. 203–5°, d. 0.9164, n 1.51571, 1.52011, 1.53282, 1.54486; *trinitrobenzene compound*, brownish tablets, m. 114°, sol. in CHCl_3 with red-yellow color. 3,4- $\text{Me}_2\text{C}_6\text{H}_3\text{NMe}_2$, b. 231.8–2.2°, d. 0.9396, n 1.54190, 1.54810, 1.56425, 1.57996; *trinitrobenzene compound*, black-violet needles, m. 103°, sol. in CHCl_3 with red-violet color. *o*- $\text{ClC}_6\text{H}_4\text{NMe}_2$, b. 207.5–8.5°, d. 1.1067, n 1.54722, 1.55278, 1.56776, 1.58130; *trinitrobenzene compound*, brown tables, m. 110–1°, sol. in CHCl_3 with light brown color. *p*- $\text{ClC}_6\text{H}_4\text{NMe}_2$, m. 35.5°; *trinitrobenzene compound*, velvety black-brown needles, m. 124°. *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{NMe}_2$, b. 154°, d. 1.1794, n 1.61021; *trinitrobenzene compound*, long yellow-red rhombic tablets, m. 112°, sol. in CHCl_3 with yellow-red color. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NMe}_2$, m. 163°; *trinitrobenzene compound*, yellow tablets sol. in CHCl_3 with lightbrown color. C. A. ROULLER

Solubility of isomeric nitroanilines in *m*-xylene. CHAPAS. *Compt. rend.* 172, 538–9(1921).—The following solys. were found for *o*-, *m*-, and *p*- $\text{NO}_2\text{C}_6\text{H}_4\text{NH}_2$ resp., in *m*- C_8H_{10} at 15°: 11.6, 1.74, and 0.28 g. per 100 g. of solvent. Solns. of *o*- $\text{NO}_2\text{C}_6\text{H}_4\text{NH}_2$ are yellow, and give small orange crystals; solns. of the *m*-isomer are yellowish, and deposit large yellow needles, while solns. of the *p*-isomer are colorless and yield brilliant slender plates.

M. R. SCHMIDT

The purpuric acids. HANS EDUARD FIERZ AND HANS BRÜTSCH. Zürich. *Helvetica Chim. Acta* 4, 375–81(1921); cf. Hans Brütisch, *Diss. Zürich* 1921.—Nietze, Hagenbach and Petri (*Ber.* 33, 1788 (1900)) regarded isopurpuric acid as dinitroamino-hydroxyisophthalic dinitrile, 2,3,5,4,6- $\text{HO}(\text{O}_2\text{N})_2(\text{NC})_2\text{C}_6\text{H}_2$ (A), but Borsche (*Ber.* 33, 2718 and 2995 (1900); 35, 569(1902); 36, 4357(1903); 37, 1843, 4389 and 4391 (1904) and 38, 3939(1905)) as a hydroxylamine $\text{HO}(\text{O}_2\text{N})_2(\text{NC})_2\text{C}_6\text{H}_2\text{NOH}$ (B).



This paper offers evidence in defence of B by showing that simple diazotization does not take place as it should if A were correct. Diazotizing B yields I, which with α -naphthol gives an *azo dye* II. 3 g. K isopurpurate (*Ber.* 33, 1788(1900)) and 1.5 g. NaNO_2 are suspended in 20 cc. HOAc at 10°, and 2 cc. concd. HCl added. The temp. rises to 25° and the soln. becomes dark brown with sepn. of NaCl and KCl. This, filtered at 10° and evapd. *in vacuo* at 15–20° and recrystd. from HOAc yields *dinitrocyanocarbinodiazophenol* (I), fine yellow clustered leaflets, exploding at 150–55°, insol. in cold H_2O , C_6H_6 , Et_2O and CHCl_3 , sparingly sol. in hot H_2O , easily sol. in abs. EtOH, Me_2CO and HOAc. By further evapn. of the mother liquor more of I is obtained, and in the last fraction *nitrocyanocarbinohydroxydiazophenol* (III), similar in all its properties to I. I can also be prepd. in small yield by suspending 24 g. K isopurpurate in 150 cc. HOAc, adding 32 cc. concd. HCl at 20–5° and filtering after 1 hr.; it forms shining red crystals. 0.8 g. of I added to 0.45 g. α -naphthol in 7 cc. 95% EtOH and 0.5 cc. HOAc

and heated to 50° gives a carmine soln. Boiled, filtered and recrystd. from hot EtOH it yields on cooling the *azo dye* II, fine needles with metallic luster, insol. in cold H₂O, C₆H₆ and Et₂O, sparingly sol. in hot H₂O, cold EtOH and Me₂CO, easily sol. in hot EtOH and Me₂CO. NaOH, NH₄OH and concd. H₂SO₄ give violet solns. Wool is dyed an intense red. Acidifying a NaOH soln. of II yields needles of extremely explosive dinitrohydroxycyanophentriazone (IV), which reduced with SnCl₂ gives 3,5,2,4,6-NC(HO)(H₂N)₂C₆CONH₂. 2,4,5,3-HO(NC)(O₂N)(HO.NH)C₆HCO₂Et can be diazotized similarly to B, whereas metapurpuric acid cannot be, giving further evidence that Borsche's formula B is correct.

C. C. DAVIS

Halogen bound to the ring carbon and its replacement by other substituents. III, Preparation of arsonic and sulfonic acids. KARL, W. ROSENMUND. Univ. Berlin. *Ber.* 54B, 438-40(1921); cf. C. A. 15, 1315.—PhAsO₃H₂ is obtained in small yield (probably most of it is destroyed at the high temp. employed) from 3 g. PhBr and 3 g. K₂AsO₃ in 5 cc. H₂O and a little CuSO₄ heated 6 hrs. in a sealed tube at 180-200°, freed from unchanged PhBr, acidified and repeatedly extd. with Et₂O. *o*-HO₂CC₆H₄AsO₃H₂ is obtained in 12-g. yield from 20 g. *o*-BrC₆H₄CO₂H in the calcd. amt. of 10% KOH heated 10-2 hrs. under a reflux at 90° with 40 cc. of 50% aq. K₂AsO₃, 20 cc. alc. and a little Naturkupfer, filtered from the *o*-HOC₆H₄CO₂H formed as by-product, allowed to cryst. 2 days and sepd. from the As₂O₃ by extn. with MeOH. PhBr (3 g.) heated 7 hrs., first at 180°, then at 200°, with the equiv. amt. of Na₂SO₃, 15 cc. H₂O and 0.1 g. CuSO₄, filtered, evapd. and treated with PCl₅ gives PhSO₂Cl, identified as the amide. *p*-MeC₆H₄SO₂Cl is similarly obtained from *p*-BrC₆H₄Me. *o*-BrC₆H₄CO₂Na with Na₂SO₃ at 120-30° yields *o*-HO₂CC₆H₄SO₃H, converted through the chloride into *o*-HO₂CC₆H₄SO₂NH₂. *m*-HO₂CC₆H₄SO₃H is similarly obtained at 170-80°. C. A. ROULLER

Some mercury compounds of cyclohexane. M. TIFFENEAU AND E. GANNAGÉ. *Bull. sci. pharmacol.* 28, 7-14(1921).—Up to the present there have not been described org. Hg derivs. of the type R₂Hg in which the radical is attached to the metal by secondary C atoms. Such compds. have been prepd. by methods reported in this paper and in general are found to be volatile substances distg. with difficulty in steam, and to some extent capable of sublimation, though usually decomp. with liberation of free Hg under these conditions. In other respects the cyclohexane derivs. of Hg act as do all the org. Hg compds. In alc. soln. they react with the halogen salts of Hg to give mixed compds. of the type XHgR according to the equation HgR₂+HgX₂=2XHgR. These mixed compds. are solids, easily crystd. from alc.; their halogen is easily displaced by AgOH with the formation of basic hydrates sol. in H₂O. For the prepn. of dicyclohexylmercury 120 g. of bromocyclohexane and 12 g. of AcOEt are shaken with 2 kg. of Na-Hg for 15 hrs., after which about 150 cc. of H₂O is added with shaking, and the mixt. distd. with steam, whereby the secondary products are gotten rid of while the chief Hg compd. remains behind as an oil. On cooling this solidifies in white plates which darken on exposure to the air. These are sepd. and purified by recrystn. from hot 95% alc. The yield is about 20%. Among the products of distn. the fraction b. 75-100° is sapond. dried and purified: distd. at 77° to 82° this yields a mixt. of cyclohexane and an unsatd. compd. which takes up Br. Among the products distg. at higher temps. (141°) a bromomercurycyclohexyl compd. is found. Dicyclohexylmercury is obtained as white needles, having a slight odor of camphor, m. 139°, sol. in 10 parts of hot alc. and insol. in H₂O. The soly. in Et₂O and C₆H₆ is greater than in alc. In the dry state the compd. is quite stable: when damp it decomp. with liberation of Hg. The halogen compds. of Hg cyclohexyl are prepd. by various methods as already suggested. The chloride crystals in white plates, sol. in Et₂O, alc., and C₆H₆, m. 159° and is stable at ordinary temps. The Br compd. m. 141°; the iodide at 142°, and the cyanide at 143°. The prepn. of di-*p*-methylcyclohexylmercury is similar to that of the compd. first described. The product is a colorless, limpid liquid, *d*₄ 1.459, *d*₆ 1.481, very sol.

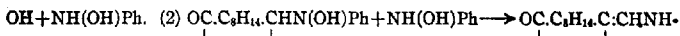
in warm alc., repptd. on cooling, sol. in Et_2O and C_6H_6 ; it reacts with the halogen salts of Hg to form mixts. of the type $\text{XHgC}_7\text{H}_{11}$; and is more stable than the lower homolog.

F. S. HAMMETT

The condensation products of phenylhydroxylamine with hydroxymethylene compounds and carbinols. I. Hydroxymethylenecamphor and phenylhydroxylamine. H. RUPF and W. DIEHL. Basel. *Helvetica Chim. Acta* 4, 388-95 (1921).—

A continuation of uncompleted work on the action of bases on hydroxymethylenecamphor (A) (cf. *C. A.* 14, 1665-7), dealing with NHPhOH (B) and its derivs. 18 g. of A and 10.9 g. of B dissolved in just enough HOAc for soln., let stand, dried over NaOH *in vacuo*, ground and washed with Et_2O , recrystd. by soln. in EtOH and addition of H_2O , yield *methylenecamphorphenylhydroxylamine*, $\text{OC}_6\text{H}_{11}\text{C}:\text{CHNPhOH}$ (C), fine yellow needles,

m. $106-7^\circ$, readily sol. in cold MeOH, EtOH, Et_2O , Me_2CO , HOAc, CHCl_3 and hot C_6H_6 , sparingly sol. in petr. ether, benzene and NH_4OH , insol. in Na_2CO_3 soln. NaOH gives a dark yellow soln. CO_2 ppts. C from solns. of its salts. Sodium salt, prepd. by rubbing together C and NaOH drying and washing with Et_2O , is a yellow powder, sol. in H_2O and EtOH, the H_2O soln. oxidizing in the air if NaOH is present. Copper salt (D), prepd. by shaking at 0°C with $\text{Cu}(\text{OAc})_2$ soln. (equal parts EtOH and H_2O), drying and removing B with warm benzene, is a brownish black amorphous powder, sol. in most org. solvents. A mixt. of dil. HCl and Et_2O changes the color to yellow with pptn. of B. Warming D with EtOH gives a red soln. with pptn. of Cu_2O and a new white oxidation compd. (to be described in a future paper). A similar result is obtained by boiling with $\text{Hg}(\text{OAc})_2$. In small yield B is also prepd. by heating at 100° dry A and B until FeCl_3 gives no test for A. 5.3 g. of C in a little EtOH is dissolved in dil. NaOH and 3 times the theoretical Me_2SO added while shaking, the orange ppt. dild. with H_2O , filtered, washed with H_2O , dissolved in EtOH, cooled and pptd. with H_2O , yielding *methylenecamphorphenylmethoxyamine* (E), white fine leaflets, m. $75-6^\circ$, sol. in most org. solvents, decompd. by light, turning yellow and brown with a sublimate of yellow needles (camphorquinone). AcCl added to C at 0° , heated at 100° for 1 hr. to evap. the excess of AcCl extd. with benzene, and crystd. from EtOH, yields *methylenecamphorphenylacetoxylamine* (F), fine white leaflets, m. $162-4^\circ$, sol. in cold MeOH, EtOH, Et_2O , hot gasoline and benzene, sparingly sol. in cold MeOH and EtOH, insol. in H_2O . Ac_2O in place of AcCl forms a white oxidation product (probably that mentioned under the Cu salt). 5 g. $\text{C}_6\text{H}_5\text{N}$ added to 10 g. of C in C_6H_6 , then 6-8 g. of $p\text{-C}_6\text{H}_4(\text{NO}_2)\text{COCl}$, heated 2-3 hrs. at $60-70^\circ$, let stand 1 day, dild., extd. with Et_2O , the excess of $p\text{-C}_6\text{H}_4(\text{NO}_2)\text{COCl}$ removed by Na_2CO_3 , the Et_2O evapd., and recrystd. from EtOH yields *methylenecamphorphenyl-p-nitrobenzoylhydroxylamine* (G), fine bright yellow needles, sol. in Et_2O , C_6H_6 and hot gasoline, sparingly sol. in cold EtOH. Reduction of C. Zn dust added to C in HOAc, the temp. held at 100° until the soln. becomes almost colorless and H is evolved, the residue removed, and the soln. poured into H_2O , gives a yellow white oil which on standing becomes a hard dirty white mass. Addition of H_2O to a filtered EtOH soln. of this forms small prisms, which, recrystd. from MeOH, yield *methylenecamphoranilide*, colorless strongly refractive prisms (poor yield), m. $165-7^\circ$, identical with a compd. previously described by Bishop, Claisen and Sinclair (*Ann.* 281, 358 (1894)). Action of NaOH on C.—15 g. of C in 30 cc. concd. NaOH and 270 cc. H_2O at 100° in a H atm. forms a heavy red-yellow oil, setting to a cryst. cake, which proved to be azoxybenzene (yield 2.2 g.). The supernatant liquor acidified, extd. with Et_2O and the Et_2O in turn extd. with NaOH and acidified, yields hydroxymethylenecamphor (yield 6.55 g.). From the Et_2O is obtained by recrystn. from dil. EtOH *methylenecamphor* (yield 1.15 g.). These compds. are probably formed as follows: (1) $\text{OC}_6\text{H}_{11}\text{C}:\text{CHN}(\text{OH})\text{Ph} + \text{H}_2\text{O} \longrightarrow \text{OC}_6\text{H}_{11}\text{C}:\text{CH}$

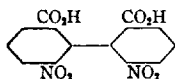


(3) $\text{PhNO} + \text{NH}(\text{OH})\text{Ph} \longrightarrow \text{PhNO:NPh} + \text{H}_2\text{O}$. C. C. DAVIS

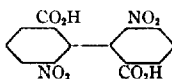
The constituents of pine resin. The composition of pimaric acid. GEORGES DUPONT. *Compt. rend.* 172, 1184-6 (1921).—Pimaric acid, prepd. as previously described (cf. C. A. 15, 2198), was found by a study of the rotatory dispersion of its fractions to contain only *d*- and *l*-pimaric acids. About 27% of the former and 63% of the latter are present. The possibility of the presence of a third substance following the same law of dispersion will be discussed in a later paper.

T. G. PHILLIPS

A second form of 6,6'-dinitrodiphenic acid and its conversion into new cyclic systems. JAMES KENNER AND WILFRID V. STUBBINGS. Univ. Sheffield. *J. Chem. Soc.* 119, 593-602 (1921).—6,6'-Dinitrodiphenic acid was first prepared by Schulze (*Ann.* 203, 95) who found the m. p. to be 297°; this was obtained by nitrating diphenic acid and also by oxidizing the di-NO₂ deriv. of phenanthraquinone. The synthetic acid, from (CO₂H)NO₂C₆H₃I, m. 263°, and is called the γ -acid, since Schulze termed his product the β -acid. Chem. reactions indicate that this is really a new form and that the two are probably stereoisomeric:

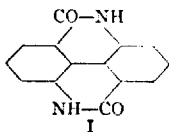


β -Form

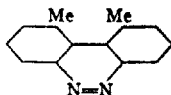


γ -Form

Methyl 2-chloro-3-nitrobenzoate, C₈H₆O₄Cl, needles, m. 70°. *Ethyl ester*, C₁₀H₈O₄Cl, b. 314°. The Me ester, treated at 210° with Cu powder and then heated 1 hr. at 225-235°, gave *methyl γ -6,6'-dinitrodiphenate*, C₁₆H₁₂O₆N₂, pale yellow, hexagonal plates, m. 132-3°. *Ethyl ester*, prepd. from *ethyl 2-iodo-3-nitrobenzoate* (large, tabular crystals, m. 54°), large yellow crystals, m. 140-2°. Sapond. with H₂SO₄, γ -6,6'-dinitrodiphenic acid was obtained, thin plates, m. 263°. The stannous, silver, lead, ferric and copper salts are sparingly sol. in hot H₂O; the mercuric, cobalt, calcium, magnesium and barium salts are sol. in H₂O. The acid does not yield an anhydride when heated with Ac₂O. Chloride, prisms, m. 157°. Amide, C₁₆H₁₀O₄N₄, m. 276°. Dianilide, C₂₄H₁₈O₄N₄, flat, diamond-shaped crystals, m. 232-4° (decompn.). The hydrazide, C₁₆H₁₀O₄N₄, by shaking the chloride with N₂H₄·H₂O did not m. 290°. Diacetate of the hydrazide, C₁₈H₁₂O₆N₄, small prisms, m. 214-5°. It would appear that a change of configuration occurs in this reaction, and that upon hydrolysis of the γ -acid chloride the β -acid might be obtained; expt. showed that the original acid was recovered. 6,6'-Diamino-2,2'-ditolyl, C₁₄H₁₄N₂, clusters of slender needles, m. 136°. Diacetate, clusters of transparent needles, m. 205°. Upon oxidation with KMnO₄ and MgSO₄ in H₂O, γ -6,6'-diacetylaminodiphenyl acid was obtained as large prismatic needles, did not m. 300°. This indicates that inversion occurs either during reduction or during the conversion into the acid. Upon reduction of the γ -acid, the diacetam of γ -6,6'-diaminodiphenic acid (I) is formed, pale yellow needles; it was also obtained from the di-Ac deriv. by heating with Ac₂O for 10 hrs., or by boiling with 70% H₂SO₄ for 25 min. The soln. in concd. H₂SO₄ has blue fluorescence. The reduction of 6,6'-dinitroditolyl with Na-Hg gave 1,10-dimethyl-5,6-naphthalisodiazine (II), yellow, transparent prisms, m. 96-7°.



I



II

C. J. WEST

Hydrobenzoin rearrangement. Influence of the nature of the reagent. M. TIFFENEAU AND A. ORÉKHOFF. *Compt. rend.* 171, 400-2(1920).—Hot dil. H_2SO_4 transforms $[PhCH(OH)]_2$ and $PhCR(OH)CHPhOH$ (R being aliphatic) to $Ph_2CH-CHO$ and Ph_2CRCHO , resp. (cf. *C. A.* 3, 1277). Cold concd. H_2SO_4 however, converts $Ph_3C(OH)CHPhOH$ (A) to $Ph_2CHCOPh$, and $PhEtC(OH)CHPhOH$ (B) to a mixt. of $PhEtCHCOPh$ (C) and $EtCOCHPh_2$ (D) (cf. *C. A.* 13, 2195). The course of the reaction thus varies with the temp. and concn. of the acid used. It is also affected by the nature of the starting material, since, while B yields both C and D, $PhMeC(OH)CHPhOH$ gives only a product of type C. The question whether Ph transposition may not also be involved in the rearrangement of A is discussed. BEN. H. NICOLET

The salt-like addition products of the double carbon union with acids. F. KEHRMANN AND IWAN EPPFRONT. Univ. Lausanne. *Ber.* 54B, 417-25(1921).—The observation of v. Baeyer that dianisalacetone (A) dissolves in strong fuming H_2SO_4 with intense emerald-green color was the direct incentive for undertaking the present investigation. If it is assumed, with Vorländer, that the orange-yellow mono- and the fuchsin-red diacid salts are produced through the two double bonds, the existence of the green salt may be attributed to the ketone O atom acting as the point of union; moreover, since there are three O atoms in A, it might be objected that this is a case of 3-fold oxonium salts. Dibenzalacetone (B), however, which has but one O atom, gives lemon-yellow mono- and orange-red diacid salts with different absorption spectra so that, besides the ketone O atom, at least one of the double bonds must be the point of union with the acid. The optical behavior of B in contact with strong mineral acids can under no conditions be explained by the basic functions of the O alone, for the accumulation of ever so many acid mols. at a single point of union never exerts a material influence on the color of the monoacid salt. It seemed probable that the introduction of new double bonds into the mol. of B might increase the number of colors given with acids, and such proved to be the case, for dicinnamylideneacetone (C) yields at least three different addition products with concd. H_2SO_4 . These colored salts of unsatd. ketones were investigated spectroscopically in H_2SO_4 of different concns. because this acid does not, like the halogen acids, show a tendency to add to the double bond atomically, *i. e.* destroying the double bond and forming colorless unsatd. compds. As many satd. ketones form oxonium salts, K. and E. believe, contrary to Vorländer, that in the colored acid addition products of unsatd. ketones the ketone O may also come into play as a point of union but with the data at present available it is not possible to det. in any given case whether it is the ketone O or the double bond or both which function as the point of attack of the acid. For the present K. and E. make the following tentative suggestion: It has been found (*C. A.* 10, 473) that $PhN:NPh$ has two points of union for acids; as the assumption that the doubly bound azo N atoms may function as 5-valent atoms in no way interferes the two "adducts" were assigned the structure $RNHX:NR$ and $RN:HX:NR.HX$. The formation of the adducts increases the absorption of the $PhN:NPh$ and the color of the second (red) is deeper than that of the first (yellow); if a SO_3H group is introduced into the $PhN:NPh$, it forms only the yellow monoacid adduct. There are, therefore, factors which can overcome the activity of the secondary valences of doubly bound N and, *a fortiori*, also of O and finally of C; what holds for doubly bound N and O may also well hold for doubly bound C, *i. e.* under favorable conditions there may appear two secondary valences capable of forming addition products with acids, and by the side of 4-valent O and 5-valent N we may have 6-valent C; of course, these views can be equally well formulated according to the Werner school. The absorption curves of A, B and C in alc., alc. H_2SO_4 and concd. H_2SO_4 are reproduced. C. A. R.

The influencing of catalysts, and catalysts with a specific action. KARL ROSENMUND AND F. ZITZSCH. Univ. Berlin. *Ber.* 54B, 425-37(1921).—In spite of the advances which have been made in the use of catalysts in carrying out chemical proc-

esses, there still remains much to be done. The activity of the usual catalyzers is fixed and cannot be influenced by the experimenter; in only a few cases can the degree of activity be regulated and then generally only by physical means such as changing the temp., the pressure or the state of the catalyzer. If in a catalyzed process several reactions are possible it cannot be detd. at will in which one of these directions the reaction shall proceed. One of the first tasks in the catalyzer problem is to find means and ways of prepg. specific catalyzers which will catalyze a reaction in the desired direction. The second task consists in influencing the activity of given catalyzers both in respect to its magnitude and to its direction, a task resolving itself in its ultimate consequences into the problem of synthesizing catalyzers from unreactive substances. A prerequisite of every chem. reaction is that the reacting components be brought close together in the mutual sphere of influence; if the process is affected by a catalyzer the latter must also come into this sphere of influence. This arrangement of all the participating components, as regards their mutual positions and the distribution of forces between them, is designated in what follows as the "complex." Since between adsorption compds. and chem. compds. there are differences only of degree and even beyond the adsorption compds. intermol. influences of a still far looser sort are conceivable there is a very large number of possibilities as to the kind and form which the "complex" may assume. In general it will be extraordinarily labile, owing its formation to a momentary favorable combination of conditions in the rapid mol. movement and decomp. almost as soon as formed; it is in the manner in which this decompn. occurs that the specific action of the catalyzer finds its expression. If only the mols. of the reacting substances alone come together and the tension between the affinities conditioning the mol. compn. and those acting outwardly is not great enough to produce a chem. reaction the resulting complex decomp. into the original substances and the effect is nil. If, however, the catalyzer plays a part in the formation of the complex the arrangement of the forces is changed in magnitude and direction by the new component of the complex so that the latter does not decomp. again into the original but into new substances; according to this view *a catalyzer may bring about reactions which do not occur without it*, which is contrary to the prevailing conceptions. Without doubt the complex formation will be facilitated when one or more of the components, as a result of their innate character (e. g., those having C:O, C:C or cyclic hydrocarbon groups), have a tendency to form addition compds. If, now, to a catalytic system are added substances which also have secondary valences, they may combine with the catalyzer, forming a new catalyzer with properties different from those of the original catalyzer, so that if there are several competing reactions in the catalyzed process its direction may be changed or all the other reactions may be repressed in favor of one, so that the modified catalyzer exerts a specific action. The addition of the foreign substance may not only eliminate certain reactions but also certain catalyzers; thus, a reaction may be catalyzed by a whole series of substances, only one of which retains its catalytic activity after the addition of a certain foreign substance. Finally, it is conceivable that an inactive or hardly active substance may become very active on addition of another substance. Thus the added substance may act in several ways; it may hinder a process in one direction, favor it in another, increase the effect of one catalyzer, poison another, act simultaneously as co- and as antiferment. It has been found (C. A. 12, 2569) that acid chlorides may be reduced according to the equation $\text{RCOCl} + \text{H}_2 = \text{RCHO} + \text{HCl}$ when treated with H_2 in a hot C_6H_6 hydrocarbon in the presence of finely divided Pd and that the reduction stops at the aldehyde stage even when an excess of H is used and the reaction is allowed to proceed for a long time; at the time this was explained as being due to the C_6H_6 hydrocarbon so "poisoning" the catalyst that, although it remained active enough to bring about the first stage of the reduction, it could not effect a further reduction of the aldehyde. It has since been found, however, that the purified com. hydrocarbons used still

contained substances influencing the catalyzer and by chance they were present in such amt. and form that the formation of the aldehydes was favored and excellent yields were obtained; at other times the yields may be poor. The present systematic investigation of the effect of foreign substances on the Pd catalyzer was undertaken to eliminate such accidental influences and make the process more reliable and at the same time it served to test the theory of partial poisoning. All the comparative expts. were carried out with identically the same material, in the same app., and every conceivable precaution was taken that all the conditions should be the same. The app. consisted of an 18-mm. bomb tube to the lower end of which was sealed a curved 2-mm. tube, through which the H was introduced; in each expt. 2 g. BzCl in 10 cc. of the solvent, 0.7 g. of the catalyzer (14 mg. Pd) and the added substance, heated in an oil bath to such a temp. that the solvent boiled distinctly, were treated with H; the amt. of BzH formed was detd. by shaking in 25 cc. Et₂O with 10 cc. fresh 40% NaHSO₃ and weighing the addition product sepg. in 20 hrs., as also the small amt. of PhCH:NNHPh formed on adding PhNHNH₂ to the mother liquors; a blank expt. with BzH showed that 96% can be recovered in this way. The expts. with pure substances gave hardly weighable amts. of BzH at the temp. of either boiling C₆H₆, PhMe or cumene and the influence of the amt. of catalyzer, partial pressure of the H and rapidity of the gas flow on the amt. of BzH formed was hardly detectable. With solvents of a lesser degree of purity varying but in part considerable amts. of BzH were obtained. Small amts. of a large number of substances were then added and finally there were discovered those which, when added in the proper amt., gave any desired yield of BzH and as a result R. and Z. were able to prep. artificially a specific catalyzer. A foreign substance which was found satisfactory in most cases is sulfurized quinoline (A), prepd. by boiling 6 parts quinoline 5–7 hrs. under a reflux with 1 part S; 5 mg. of this added to 2 g. BzCl, 10 cc. PhMe and 0.7 g. catalyzer gave after 5.25 hrs. at 150–5° 88% BzH and 50 mg. yielded 80%. From 3 g. *o*-ClC₆H₄COCl, 20 cc. PhMe, 0.01 g. A and 0.5 g. of 2% Pd-kieselguhr was obtained more than 70% *o*-ClC₆H₄CHO (ordinarily the Cl is easily replaced by H). *p*-O₂N-C₆H₄COCl (3 g.), 16 cc. xylene, 0.01 g. A and 0.5 g. Pd-kieselguhr in 2.5 hrs. at 150° gave 91% O₂NC₆H₄CHO; Pd alone gives undefined colored products partially sol. in HCl and probably containing NH₂ groups. From 2.3 g. PhCH₂COCl, 8 cc. PhMe, 2 g. Pd-BaSO₄ and 0.01 g. thioquinanthrene after 4 hrs. at 125° is obtained 80% aldehyde, which, although usually easily resinified by acids, is not changed in this case by the HCl evolved.

C. A. R.

Arylsulfonylnaphthylenediamines and their sulfonic acids. GILBERT T. MORGAN AND WILLIAM R. GRIST. Univ. Birmingham. *J. Chem. Soc.* 119, 602–10 (1921).—A general method is described for the prepn. of arylsulfonyl derivs. of 1,4-C₁₀H₈(NH₂)₂ and their sulfonic acids (French Pat. 132,339). This consists in coupling PhN₂Cl with C₁₀H₇NHSO₃R and reducing with Zn dust and dil. NaOH, Zn dust and NH₄Cl, or Na₂S₂O₄, by which the arylsulfonyl group is not removed. *Toluene-p-sulfonyl-1,4-naphthylenediamine*, C₁₇H₁₆O₂N₂S, tablets, m. 185–8°. *Naphthalene-α-sulfonyl-1,4-naphthylenediamine*, C₂₀H₁₆O₂N₂S, pale mauve powder, m. 194°. *Naphthalene-β-sulfonyl-1,4-naphthylenediamine*, pale mauve solid, m. 199°. *Benzene-1,3-disulfonylbis-naphthylenediamine*, (H₃NC₁₀H₇NHSO₂)₂C₆H₄, pale mauve, m. 190–5°. *Naphthalene-2,7-disulfonylbis-1,4-naphthylenediamine*, C₃₀H₂₄O₄N₄S₂, did not darken below 300°. *Naphthalene-2,6-disulfonylbis-1,4-naphthylenediamine*, pink powder, m. 180°. *1,6-Disulfonyl derivative*, almost white powder, does not m. below 250°. *1,5-Derivative*, mauve, did not m. below 250°. *1-Toluene-p-sulfonyl-1,4-naphthylenediamine-8-sulfonic acid*, C₁₇H₁₆O₄N₂Na₂Na, prepd. from the condensation product of MeC₆H₄SO₃Cl and H₂NC₁₀H₇SO₃H (which requires the addition of a little C₆H₅N to start the reaction). PhN₂Cl, and reduction as usual, light purple powder, sol. in H₂O. The 6(7)-sulfonic acid derivatives were also prepd. *1-Toluene-p-sulfonyl-1,2-naphthylenediamine-4-sul-*

onic acid was isolated as the sodium salt, $C_{17}H_{15}O_5N_2S_2Na$, yellowish brown powder. The 5-sulfonic acid derivative is a pale yellow powder. None of the intermediate products was characterized.

C. J. WEST

The exhaustive sulfonation of naphthalene. HANS EDUARD FIERZ AND FRITZ SCHMIDT. Zürich. *Helvetica Chim. Acta* 4, 381-7 (1921); cf. *C. A.* 14, 2475.—Armstrong and Wynne in prolonged research (*Proc. Chem. Soc.* 1885-95) have shown that SO_3H groups do not enter the $C_{10}H_8$ nucleus in *o*-, *p*- or *peri*-position to one another, resulting in only 2 end products, the 1,3,6- (A) and 1,3,5,7-sulfonic acids (B). Nevertheless it is claimed (Ger. pat. 79054) that a third acid is formed by treating $C_{10}H_8$ with concd. H_2SO_4 and P_2O_5 at 260°. The reactions are technically important because of side reactions in the formation of compds. like 1,8,3,6-aminonaphtholdisulfonic acid (H acid). F. and S. have found by making salts and sulfonyl chlorides of the acids in question that (1) by the action of H_2SO_4 containing SO_3 on $C_{10}H_8$ a mixt. of A and B is always formed; (2) B yields a dimorphous Ba salt, crystg. above 30° with 8 H_2O , below 30° with 14 H_2O . Both forms give the same tetrasulfonyl chloride, m. 261-2°; (3) no other sulfonic acid could be made and the German patent is incorrect; (4) B is not attacked by HNO_3 and the loss in making H acid is from formation of tetrasulfonic acid and destruction of $C_{10}H_8$; (5) a large excess of SO_3 does not decrease the yield of A, whereas a too small amt. of oleum increases the yield of B; (6) A may be obtained technically either from 2,5- or from 2,7- $C_{10}H_4(SO_3H)_2$; (7) small amts. of 2,5- and 2,7- acids remain unchanged; (8) 1,3,6,8-nitronaphthalenetrisulfonic acid (C) is the only NO_2 acid obtained, and is formed by a method described previously, with a nitrating mixt. (Fierz, "Farbenchemie," 15 ff.). By dilu. of the mixt. to 60% H_2SO_4 , yellow needles sepd., and these dissolved in a little H_2O satd. with HCl yield white hygroscopic needles of C. Dried over $CaCl_2$ at 20 mm. they retain 16.5% H_2O . The dissociation const. $k = 0.095$. C in 4% H_2O soln. was boiled 5 hrs. and 5 cc. concd. HCl was added to 50 cc. soln. without change. $BaCl_2$ gave no ppt. Lead salt, orange-yellow, blunt, short, irregular needles with 8 H_2O , moderately sol. in H_2O and efflorescent. Barium salt, yellow needles radiating in semi-spherical form, with indeterminate H_2O of crystn. Sodium salt, orange-yellow blunt needles or prisms with 6 H_2O , stable in the air. Aniline salt, fine white radiating needles, with 2.5 H_2O , sol. in hot H_2O and EtOH, difficultly sol. in Et₂O. To form the Ba salt of B, the sulfonated liquor from (1) is neutralized with $BaCO_3$, giving an 87-92% yield. To form the sulfonyl chloride, the Ba salt is converted to the Na salt by NaOH; 1 part of dry Na salt is then heated for 9 hrs. at 100° with 2 parts PCl_5 and 3 parts $POCl_3$, poured on ice, filtered and dried at 40°, giving an 85-95% yield. Methods for the purification of the chloride have been previously published (Schmid, *Diss. Zürich* 1920).

C. C. DAVIS

Dinitroanthraquinones. M. BATTEGAY AND J. CLAUDIN. *Bull. soc. ind. Mulhouse* 86, 628-31 (1920).—Anthraquinone was subjected to dinitration according to the method of Roemer (1882), then reduced by the method of Noeltling and Wortmann. From the product thus obtained the authors have been able to sep. all the 1,6-, nearly all the 1,8-, and a large part of the 2,6-diaminoanthraquinone. There remains a mixt. of diaminoanthraquinones which were transformed by diazotization into dihydroxyanthraquinones. The results indicate that the dinitration of anthraquinone yields about 37% of the 1,5-, 37 of 1,8-, 4.2 of 1,7-, 3.6 of 1,6-, 6.0 of 2,6- and 4.0 of 2,7-dinitroanthraquinone, which totals 91.8%, the missing 8.2% representing losses by manipulation. On repeating the expts. of Dhar (cf. *C. A.* 14, 3404) a crude product was obtained m. 315-320°. Attention is called to Dhar's omission to include the dinitrated product contained in the filtrate which may be pptd. with water and forms nearly 22% of the total. This product m. 200-220°. The crude product of bromination m. 215-220°. This was repeatedly extd. with alc. and sepd. into 2 fractions, sol. (A) and insol (B). The part A upon fractional crystn. gave a deriv. sparingly sol. in alc., m. 280°, and one easily sol.

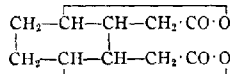
in alc. m. 234°, which are probably 1,2- and 1,3-dibromoanthraquinones, resp. Part B was completely sol. in C_6H_6 and sepd. by fractional crystn. into a part sparingly sol. in C_6H_6 , m. 292°, corresponding to 1,5-dibromoanthraquinone, and a part freely sol. m. 224°, which mixed with 1,8-dibromoanthraquinone results in no lowering of the m. p.

L. W. RIGGS

Dibromoanthraquinones. M. BATTEGAY AND J. CLAUDIN. *Bull. soc. ind. Mulhouse* 86, 632-5(1920).—The dibromoanthraquinone of Gräbe and Liebermann, obtained either by direct bromination of anthraquinone at 100°, or by oxidation of tetra-bromoanthracene, differs from that obtained by the diazotizing of 1-amino-2-bromoanthraquinone. The first m. 265° (?), and is sol. in H_2SO_4 , the yellow soln. giving a white ppt. with water. Of the second, the 1,2-deriv. consists of yellow crystals, m. 223°, and the orange-yellow soln. in H_2SO_4 is pptd. by water as pale yellow flakes. These crystals are easily transformed to alizarin by heating with milk of lime in a sealed tube. The 1,3-isomer results from the deamidation of either 1-amino-2,4-dibromo- or 2-amino-1,3-dibromoanthraquinone; orange-yellow crystals, m. 209-10°, sol. in H_2SO_4 to a yellow soln. which is pptd. as yellow flakes by water. The 1,4-isomer is prepd. by replacement of two amino groups by Br_2 in 1,4-diaminoanthraquinone; orange needles, m. 196°. The 2,3-isomer is obtained by applying again the Sandmeyer reaction to 2,3-bromoaminoanthraquinone; yellow needles, m. 281°, gives an orange-yellow soln. with H_2SO_4 , pptd. by water as white flakes; heated with milk of lime in a sealed tube it is transformed into hystazarin; fused with NaOH it gives Na alizarinate. The 1,5- and 1,8-isomers prepd. by the action of Br upon the corresponding disulfoanthraquinones, m. 292° and 230°, resp. 2,7-Isomer, prepd. by the Sandmeyer reaction upon 2,7-diaminoanthraquinone, brilliant yellow plates, m. 248°, gives an orange soln. with H_2SO_4 , which yields a white ppt. with water.

L. W. RIGGS

Anemonin derivatives. Y. ASAHINA AND A. FUJITA. *J. Pharm. Soc. Japan*, No. 470, 331-5(1921); cf. *C. A.* 14, 1384, 3227.—As supplementary to the study on anemonin, A. and F. give physical and chem. characteristics of some of its derivs. During reduction of anemonin with Na-Hg and AcOH, there is always produced a cryst. compd., m. 98°, besides dihydroanemonin. If MeOH is used as a solvent, the crystals m. 98°, and one other viscous substance is formed. If dihydroanemonin is treated in a similar manner, the same compd. is formed. This white cryst. substance, m. 98°, is stable towards $KMnO_4$, but with NH_3 gives a beautiful pyrrole reaction. Its compn., $C_{17}H_{18}O_6$, corresponds to anemonol dimethyl ether. When anemonin is reduced by Na-Hg in boiling EtOH, a cryst. compd., $C_{10}H_{12}O_4$, m. 142°, is formed, which is also obtained from the 2 hydroanemonins. It is isotetrahydroanemonin, whose structure is probably:



Anemonin dihydrobromide when treated with glacial AcOH and excess of anhydrous NaOAc gives anemonin, showing that during the bromination, the tetramethylene ring is not opened up. When furan- α,α' -dipropionic acid is reduced with glacial AcOH and Pt black, it gives tetrahydrofuran- α,α' -dipropionic acid, m. 133°. The Bz deriv. of dihydroanemonin m. 225°; furfural deriv. m. 222°. Anisaltetrahydroanemoninic acid m. 160°.

S. T.

Non-aromatic diazonium salts. VI. 3,5-Dimethylisoxazole-4-diazonium salts and their azo derivatives. GILBERT T. MORGAN AND HENRY BURGESS. Univ. Birmingham. *J. Chem. Soc.* 119, 697-703(1921); cf. *C. A.* 10, 1327.—Nitro-3,5-dimethylisoxazole, $C_5H_6O_2N_2$, by adding 16 cc. HNO_3 (d. 1.42) to a mixt. of 32 cc. concd. H_2SO_4 and 15 g. 3,5-dimethylisoxazole at 0°, and then adding 64 cc. concd. H_2SO_4 and

allowing the soln. to stand at room temp. overnight, then warming 15 hrs. at 100°, transparent, hexagonal plates from hot H₂O or alc., m. 63.5°. It is volatile with steam and appreciably volatile at room temp. Reduced with Al-Hg and moist ether, 4-amino-3,5-dimethylisoxazole, C₈H₉ON₂, is formed, prisms, m. 56-7°. The hydrochloride forms prismatic needles, decomp. 212-4°. Acetate, transparent, prismatic needles, m. 108-9°. Benzozole, rosettes of needles, m. 190-1°. 4-Benzylideneamino-3,5-dimethylisoxazole, PhCH:NC₆H₄ON, from the base and BzH, yellowish white needles, m. 52-3°. 4-o-Nitrobenzylidene derivative, pale greenish yellow prismatic needles, m. 124-5°. 4-m-Nitrobenzylidene derivative, pale brownish yellow prismatic needles, m. 156-6.5°. 4-p-Nitrobenzylidene derivative, golden yellow prismatic needles, m. 184-5°. The base may be diazotized in HCl, HNO₃, or H₂SO₄ giving a diazo salt, sol. in water and decomp. at the ordinary temp. 3,5-Dimethylisoxazole-4-diazonium chloroaurate, C₈H₉ON₂AuCl₄, yellow, m. 107-8°. 3,5-Dimethylisoxazole-4-azo-β-naphthol, C₁₈H₁₅O₂N₃, dark orange needles, m. 202-3°. 3,5-Dimethylisoxazole-4-azoresorcinol, C₁₁H₁₁O₂N₃, yellow needles, m. 217°. 3,5-Dimethylisoxazole-4-azo-β-naphthylamine, brownish red needles, m. 179-180°.

C. J. WEST

4-β-Methylaminoethylglyoxaline. ROBERT G. FARGHER AND FRANK L. PYMAN. Wellcome Chem. Research Lab. *J. Chem. Soc.* 119, 734-40(1921).—Ethyl α-chloro-β-glyoxaline-4-propionate sesquioxalate, (C₈H₁₁O₂N₂Cl)₂(C₂H₅O₂)₂, m. 161-3°. dl-α-Methylamino-β-glyoxaline-4-propionic acid (dl-methylhistidine), C₇H₁₁O₂N₂, by heating 44 g. C₈H₁₁O₂N₂Cl and 176 cc. 40% MeNH₃ in sealed tubes for 5 hrs. at 110° and purifying through the picrate and HCl salt, anhydrous needles, m. 270°, tastes sweet with a bitter after-taste. When the crude reaction product was treated with picric acid and the product fractionated, the dipicrate was obtained in the 2nd fraction, prismatic needles with 3 mols. H₂O, 2 of which are lost at 60° and the 3rd at 90°; air-dry, it m. 70°; dried, 132°. The sesquipicrate, obtained from the oil which 1st ppts., large, glistening rhombic prisms, m. 193°, and appear to contain 7 mols. H₂O, 6 of which are lost at 60° *in vacuo*, while the last is not removed at 110°. Monopicrate, from the base and 1 mol. acid, minute flattened prisms, m. 118° and contain 3 mols. H₂O. Dihydrochloride, large diamond-shaped plates from dil. HCl, m. 134°, contains 1 H₂O. The soln. in Na₂CO₃ gives a blood-red color with SO₂NaC₆H₄N₂OH. Chloroaurate, glistening, pale orange, flattened prisms, decomp. 115°. Benzozole, C₁₄H₁₃O₂N₂, clusters of minute prisms from H₂O, with 0.5 H₂O, m. 241°. 4-β-Methylaminoethylglyoxaline, C₆H₁₁N₂, was prepd. from the benzoate by heating at 240° in a vacuum till all frothing ceased, then dissolving in 4 cc. of 20% HCl and heating 1 hr. at 180°, or by heating the dihydrochloride in 20% HCl in sealed tubes for 2 hrs. at 280°. The dipicrate forms well defined, bright yellow needles, with 2 mols. H₂O, one of which is lost at 60° *in vacuo*, decomp. 220°. The dihydrobromide, fern-shaped clusters of needles from alc., m. 275° and contains 2H₂O. The soln. in Na₂CO₃ gives a blood-red color with SO₂NaC₆H₄N₂OH. The yields were poor and the physiol. action was only about 0.01 that of 4-β-aminoethylglyoxaline.

C. J. WEST

Benzoyl- and picolinoylbenzimidazole. A. BISTRZYCKI AND ALEXANDER LECCO. Freiburg. *Helvetica Chim. Acta* 4, 425-38(1921); cf. *Ber.* 23, 1042(1890); 24, 627(1891), and Heiberg, *Diss. Freiburg* 1898.—Among the methods of Thiele and Falk (*Ann.* 347, 114(1906)), Wetter (*Diss. Basel* 1902) and Rupe and Thiess (*C. A.* 4, 453) for the prepn. of o-benzoyl-2,1-benzimidazole (A), that of Wetter from C₆H₅(CO)₂O (B) and o-C₆H₄(NH₂)₂ (C) was chosen for investigation. The method was extended to new derivs. and to the condensation of tetrachlorophthalic acid (D) and quinolinic acid (E) with C. The results obtained are in brief that (1) A is formed in good yield by fusing equimol. wts. of B and C and heating with Ac₂O; (2) NH₃, PhNH₂, H₂NNH₂, and PhHNNH₂ split the lactam ring of A, forming [benzimidazolyl-2']-2-benzoic acid derivs.; (3) D reacts with C like B; (4) E reacts with C in the same way, forming picolinoyl-

benzimidazole (F), but partially splitting to CO_2 and nicotinic acid; (5) NaOH , EtOH , NH_3 , and PhNH_2 split the lactam ring of F similarly to A; (6) E fused with C forms β -pyridyl-2-benzimidazole (G). 7.4 g. of B and 5.4 g. of C fused at $120\text{--}30^\circ$, boiled with Ac_2O and filtered, yields A (8.6 g.). [Benzimidazolyl-2']-2-benzamide, $\text{H}_2\text{NCO-C}_6\text{H}_4\text{C}(\text{N:C:N:C}_6\text{H}_4\text{NH})$, from A and concd. NH_4OH , forms colorless needles from PhNO_2 ,

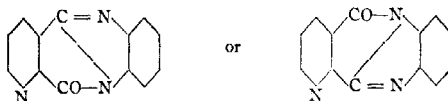
m. 264° (decompn.), sparingly sol. in boiling abs. EtOH , easily sol. in HOAc and dil. HCl . 2-Benzanilide, from a soln. of A in PhNH_2 on cooling, recrystd. from boiling PhNO_2 as colorless clustered microneedles, m. 327° , insol. in most org. solvents. 2-Benzohydrazide, from heating A in 50% H_2NNH_2 , forms colorless needles from PhNO_2 , decomp. 293° , sol. in boiling HOAc and cold dil. HCl , insol. in most org. solvents. The phenylhydrazide has been prepd. by Rupe and Thiess (C. A. 4, 453) who reported m. 244° . Prepd. by heating A and excess PhNHNH_2 alone, it formed micro-

needles, m. 262° . Tetrachloro-o-benzoyl-2,1-benzimidazole (H) $\text{C}_6\text{Cl}_4\text{C}(\text{C}=\text{N})\text{CO-N}(\text{C}_6\text{H}_4)$,

prepd. by heating at 250° equimol. wts. of D and C in PhNO_2 until cessation of H_2O vapor, and washing with Et_2O , forms greenish yellow flat prisms (yield 76%), m. $290\text{--}1^\circ$, sol. in concd. H_2SO_4 with brown color, somewhat sol. in boiling $\text{C}_6\text{H}_5\text{Me}_2$, sparingly sol. in boiling EtOH and Me_2CO . [Benzimidazolyl-2']-2-tetrachlorobenzoic acid (I), from H in boiling alc. NaOH , dild. with H_2O , neutralized with HOAc , and recrystd. from dil. HOAc , forms colorless clustered microneedles (quant. yield), m. 236° to a yellow liquid (formation of anhydride), sol. in $\text{C}_6\text{H}_5\text{N}$, sparingly sol. in boiling abs. EtOH , $\text{C}_6\text{H}_5\text{Me}_2$, HOAc , Me_2CO and concd. H_2SO_4 , insol. in boiling dil. HCl and H_2SO_4 . Anhydride, by boiling I with Ac_2O , yellow solid. [Benzimidazolyl-2']-2-tetrachlorobenzo-N β -phenyl-

hydrazide, $\text{PhNHNH.COC}_6\text{Cl}_4\text{C}(\text{C}=\text{N})\text{NH}(\text{C}_6\text{H}_4)$, from heating H with excess of PhNH-NH_2 , recrystd. from PhNO_2 , forms small radiating rhombic plates, decomp. 295° , diffi-

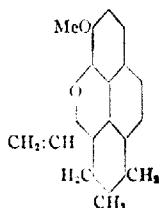
culty sol. in EtOH , $\text{C}_6\text{H}_5\text{Me}_2$, Me_2CO and HOAc . α,β -Picolinoyl-2,1-benzimidazole (J), prepd. by a modification of the method of Camps (Arch. Pharm. 240, 352 (1902) for analogous compds., by heating at $135\text{--}45^\circ$ equimol. wts. of E and C until solid, dissolving in boiling Ac_2O , filtering, and pptg. a mixt. of nicotinic acid and J by Et_2O (leaving pyridylbenzimidazole in soln.), extg. J from the residue with boiling C_6H_6 , forms a bright yellow cryst. powder (yield 10–30%), m. $219\text{--}20^\circ$, sol. in HOAc , boiling HCl , concd. H_2SO_4 (green-brown color), sparingly sol. in abs. EtOH , C_6H_6 , cold HCl and Me_2CO . The formula may be either of the following:



with the first probable because a C:O group in the α -position was shown by Ostwald (Z. Pharm. Chem. 3, 386 (1880)) to be too weakly acid to combine with a base like C. [Benzimidazolyl-2']-3-pyridyl-2-carboxylic acid (K), from J in excess of boiling 0.25 N NaOH , acidified with HOAc , forms on long standing clustered needles (quant. yield), m. $246\text{--}7^\circ$ (decompn.), sol. in dil. HCl and boiling HOAc , sparingly sol. in EtOH and H_2O , insol. in C_6H_6 . Hydrochloride, from K in excess of concd. HCl , shining needles decomp. 227° , sol. in absolute EtOH , difficultly sol. in cold H_2O . Methyl [benzimidazolyl-2']-3-pyridyl-2-carboxylate (L), from J in warm MeOH with a trace of MeOK as catalyzer (Schroeter, C. A. 14, 2189; Ber. 25, 1989 (1892), and Cybulski, Diss. Berne 1892), recrystd. from MeOH , shining prisms, decomp. $195\text{--}6^\circ$, sol. in MeOH , EtOH ,

Me_2CO , cold dil. HCl and HOAc , difficultly sol. in C_6H_6 . [*Benzimidazolyl-2'*]-3-pyridyl-carbamide, from J and concd. NH_4OH , recrystd. from PhNO_2 , fine clustered needles, m. 266° , sol. in boiling PhNO_2 , warm HOAc , sparingly sol. in abs. EtOH , Me_2CO , C_6H_6 and H_2O . 2-Carbanilide, from J in boiling PhNH_2 , recrystd. from PhNH_2 , fine closely grouped needles, m. $315-7^\circ$, sol. in hot PhNH_2 , dil. HCl , scarcely sol. in any org. solvent except HOAc . β -Pyridyl-2-benzimidazole, from its $\text{Et}_2\text{O}-\text{Ac}_2\text{O}$ soln. in the prepn. of J (see this) by evapn. of the Et_2O , diln. with H_2O , addition of NH_4OH at 100° , and recrystn. from HOAc , prisms, m. 310° , sol. in boiling HOAc , cold dil. HCl and H_2SO_4 , sparingly sol. in $\text{C}_6\text{H}_5\text{N}$, almost insol. in most org. solvents, and very difficult to burn, requiring for analysis PbCrO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$. C. C. DAVIS

Two new reduction products of codeine. C. MANNICH AND H. LÖWENHEIM. *Arch. Pharm.* 258, 295-316(1920); *J. Chem. Soc.* 120, I, 124.—The difficulties encountered in the investigation of morphine and codeine, due to rearrangement into apomorphine, migration of the OH group (Kunorr, *C. A.* 1, 1285), or the elimination of C atoms, along with N, by exhaustive methylation, are all connected with the partly reduced benzene nucleus. The authors have, therefore, sought a means of so modifying this nucleus by well defined processes as to obviate the occurrence of the anomalous behavior referred to, and so permit the application of the usual methods for detg. constitution. Dihydrocodeine (Skita and Frank, *C. A.* 6, 231) may be obtained in 3 forms; a *dihydrate*, $\text{C}_{18}\text{H}_{25}\text{O}_2\text{N} \cdot 2\text{H}_2\text{O}$, which seps. from alc. in large plates, m. 55° , and is converted above its m. p. into a 2nd *dihydrate*, m. $87-8^\circ$; the anhydrous compd. m. $111-2^\circ$. It is unchanged by distn. with CH_2O_2 , but with HI gives dihydromorphine. m. $156-8^\circ$. Chlorodihydrocodeine (Freund, *C. A.* 15, 834), m. $172-4^\circ$, gives a hydrochloride, m. 203° , and a *methiodide*, $\text{C}_{18}\text{H}_{25}\text{O}_2\text{NCl}$, needles, m. 244° , and is converted by HI into *chlorodihydromorphine*, $\text{C}_{17}\text{H}_{23}\text{O}_2\text{NCl}$, prisms, m. 233° , which is apparently dimorphous. The Cl atom in these compds. is very inert, and could not be replaced by H. Freund's results from the reduction of α -chlorocodide were confirmed, but, in addition, small quantities of the products of reduction of β -chlorocodide were observed. The latter compd., in presence of Pd, gave rise to a mixt. in which *deoxydihydrocodeine*, $\text{C}_{18}\text{H}_{25}\text{O}_2\text{N}$, m. 107° , $[\alpha]_D -81.47^\circ$, predominated. It contains 1 MeO group, and gives a yellow *picrate*, m. 207° , but no Ac deriv. In it, therefore, the object of the investigation as above described, is attained, since the OH group of codeine is replaced by H, and the benzene nucleus in question reduced. Correspondingly, its *methiodide*, $\text{C}_{18}\text{H}_{25}\text{O}_2\text{N} \cdot \text{I}$, prisms, m. $256-7^\circ$, behaves normally towards KOH , and gives *deoxydihydrocodomethine*, $\text{C}_{18}\text{H}_{25}\text{O}_2\text{N}$, m. 86° (*picrate* m. 154° ; *hydrochloride*, $\text{C}_{18}\text{H}_{25}\text{O}_2\text{N} \cdot \text{HCl} \cdot \text{H}_2\text{O}$, needles, m. 222°). From its *methiodide*, $\text{C}_{23}\text{H}_{33}\text{O}_2\text{N} \cdot \text{I}$, needles, m. 238° , by treatment with KOH , Me_3N and 3-methoxy-5-vinylhexahydrophenanthrylene oxide (annexed formula) $\text{C}_{17}\text{H}_{19}\text{O}_2$, prisms, m. 80° , were obtained. The latter compd. gives an oily dibromide, and, by reduction in the presence of Pd, 3-methoxy-5-ethylhexahydrophenanthrylene oxide, prisms, m. 69° . *Deoxytetrahydrocodeine*, $\text{C}_{18}\text{H}_{25}\text{ON}_2 \cdot 0.5\text{H}_2\text{O}$, needles, m.



$144-5^\circ$, $[\alpha]_D -36.92^\circ$, is the 2nd product of reduction of β -chlorocodide, and is also obtained by Clemmensen's method from *dihydrocodeinone*, $\text{C}_{18}\text{H}_{21}\text{O}_2\text{N}$, m. $103-4^\circ$ (*hydro-*

chloride, $C_{18}H_{21}O_2N \cdot HCl \cdot 2H_2O$, m. 82° ; *oxime*, $C_{18}H_{21}O_2N_2$, m. 266°), which is itself obtained from codeinone by reduction in the presence of Pd. Deoxytetrahydrocodeine gives a *methiodide*, $C_{19}H_{23}O_2NI$, needles, m. 256° , but no Ac nor Bz deriv.

W. O. E.

Physical and physiological properties of some hydrogenated quinoline compounds. AKIRA SHIMOMURA AND JULIUS BEREND COHEN. Univ. Leeds. *J. Chem. Soc.* **119**, 740–7(1921).—From the spectrographic investigation of certain quinoline derivs. and aromatic amines, it is concluded that: A hydrogenated quinoline compd. shows a different absorption from that of the original compd., due to the change of structure of the mol. This curve is very similar in its general form to that of the corresponding alkylated aromatic amine. As the degree of hydrogenation increases in a quinoline compd., the tendency to exhibit distinct absorption bands decreases. A compd. of higher mol. wt. shows more bands than one of a lower mol. wt. Although α - and β -naphthaquinolines show rather similar absorption, that of their tetrahydro derivs. is entirely different. The antiseptic value of some of these compds. is reported. C. J. WEST

Angostura alkaloids. J. TROEGER AND K. BÖNICKE. *Arch. Pharm.* **258**, 250–77 (1920); *J. Chem. Soc.* **120**, I, 121. Of the angostura alkaloids, the existence of galipidine and cusparidine has not been confirmed by Troeger and Kroseberg (*C. A.* **7**, 211). An examn. of the sample of the former base prepd. by Beckurts and Frerichs (*Arch. Pharm.* **243**, 470) has now shown that it gives an oxalate identical with that of galipine. *Galipine hydroiodide*, $C_{20}H_{21}O_3N \cdot HI$, yellow crystals, m. 178° , was also obtained from "galipidine." By analysis of this salt, and of known derivs., the formula $C_{20}H_{21}O_3N$ originally attributed to galipine is confirmed (cf. Troeger and Kroseberg, *l. c.*). From nitrogalipine the *hydrobromide*, $C_{20}H_{20}O_3N_2 \cdot HBr \cdot 2H_2O$ (yellow needles, m. 177° , which become anhydrous at 100°), the *hydroiodide*, $C_{20}H_{20}O_3N_2 \cdot HI \cdot 3H_2O$ (yellow needles, m. 182°), and the *methiodide*, $C_{20}H_{20}O_3N_2 \cdot MeI$, m. 170° , were prepd. Demethylation of the NO_2 compd. by dry HCl (cf. Troeger and Mueller, *C. A.* **9**, 2079) leads to a product which is difficult to purify, but by this treatment at a temp. not exceeding 190° , galipine is converted into the phenol, $C_{17}H_{15}O_3N$, m. 225° (*hydrochloride*, $C_{17}H_{15}O_3N \cdot HCl \cdot 1.5H_2O$, yellow prisms, m. 112° ; *hydrobromide*, $C_{17}H_{15}O_3N \cdot HBr \cdot H_2O$, yellow prisms, m. 85°). Galipine further resembles cusparine in that it is isomerized when gradually heated in a stream of MeI vapor from 130° to 190 – 200° . *Isogalipine*, $C_{20}H_{21}O_3N$, silky needles, m. 165° , contains 2 MeO groups and 1 MeNH group. The *hydrochloride*, $C_{20}H_{21}O_3N \cdot HCl \cdot 1.5H_2O$, plates m. 234° ; *hydrobromide*, $C_{20}H_{21}O_3N \cdot HBr \cdot H_2O$, yellow prisms m. 223° ; *hydroiodide*, $C_{20}H_{21}O_3N \cdot HI \cdot H_2O$, yellow prisms, m. 206° ; *chloroplatinate*, $(C_{20}H_{21}O_3N)_2 \cdot H_2PtCl_6 \cdot 4H_2O$, dark yellow prisms, m. 198 – 9° (decompn.); the methiodide seems to be very unstable, and so does not lend itself to degradation by exhaustive methylation. *Nitroisogalipine*, $C_{20}H_{20}O_3N_2$, yellowish brown needles, m. 237° , has very slight basic properties, but gives a *hydroiodide*, $C_{20}H_{20}O_3N_2 \cdot HI \cdot H_2O$, light yellow needles, m. 167 – 72° . The analogous behavior of galipine and cusparine is considered to favor the identity of the acid, m. 262 – 4° , obtained by the oxidation of galipine (Troeger and Mueller, *l. c.*); with the acid m. 271 – 2° , from cusparine (Troeger and Beck, *C. A.* **8**, 674). If this is so, it follows that cusparine, like galipine (Troeger and Kroseberg), is also derived from 6-methoxyquinoline. The products of decompn. of galipine sulfate (Koerner and Boehringer, *Gazz. Chim. ital.* **13**, 363) consist of more or less completely demethylated derivs. The conditions for the formation of galipine methiodide are at present not at all clear, a circumstance which has so far prevented definite results from being obtained by exhaustive methylation.

W. O. E.

Soma carbamido acids and their hydantoins. JOHN RICHARD SCOTT AND JULIUS BEREND COHEN. Univ. Leeds. *J. Chem. Soc.* **119**, 664–72(1921).—Diketotetrahydroquinazoline (Bogert and Scatchard, *C. A.* **14**, 183) may also be prepd. by heating 6.5 g. $H_2OCC_4H_4NHCONH_2$ for 0.5 hr. with 50 cc. concd. HCl, the yield being 5.5 g.

The Na salt contains 5 H₂O. The di-Me ether was prepd. by the use of Me₂SO₄ and no MeI. A chloroamine derivative, C₈H₅O₂N₂Cl, was prepd. by the action of NaOCl, unstable and gradually loses Cl on exposure to the air. *o*-Acetylcarbamidobenzoic acid AcNHCONHC₆H₄CO₂H, felted needles from dil. AcOH or alc., m. 225°. Benzate, by shaking an alk. soln. of the carbamido acid with BzCl, long prisms from hot H₂O, decomp. about 200°. 3-Aminophthalic acid, by reduction of the NO₂ deriv. with SnCl₂ and concd. HCl, needles, m. 191-2° (decompn.). Hydrochloride, fine needles, m. 225° (decompn.). 3-Carbamidophthalic acid (I), C₈H₅O₂N₂·0.5H₂O, greenish yellow cryst. powder, m. 183-5° (decompn.). Heated with Ac₂O, it forms acetylcarbamidophthalic anhydride m. 246-7°. Diketotetrahydroquinoxalinecarboxylic acid (II), C₈H₅O₄N₂, by heating I g. I with a mixt. of 15 g. concd. HCl and 10 cc. H₂O until most of the HCl is removed; minute needles from H₂O, sublimes slowly above 280°, does not m. 320°. Sodium salt radiating masses of slender needles, containing 3H₂O of crystn. II dissolves in NaOC with a brown color, and AcOH throws down a very unstable ppt., which could not be obtained pure, nor could the Na salt. Dimethyl ether, C₁₁H₁₀O₂N₂, by warming a mixt. of 4 g. II in NaOH and 4 g. Me₂SO₄ for 1 hr., minute needles from alc.-H₂O, m. 307-311°. On using a large excess of Me₂SO₄ the Me ester described below was obtained. 1-Methyl 2-hydrogen 3-carbamidophthalate, m. 162°. Methyl ester of II, m. 310-2°. Heated with Me₂SO₄ in alk. soln. this yields the methyl ester of the dimethylhydantoin, MeO₂C C₆H₃N₂:C(OMe).N:CO₂Me, fine needles, m. 144°. Upon nitration, II gives a mixt.

of the mono- and di-NO₂ derivs., which could not be purified through the Na salt. 4-1 Acetoxybenzylhydantoin, colorless needles, m. 117-8°. *O,O*-Dimethyl ether, C₁₁H₁₀O₂N₂, by the use of Me₂SO₄, glistening needles, m. 144-5°. 4-*p*-Hydroxybenzylhydantoin *O,O*-dimethyl ether, by hydrolysis with HCl, glistening foliated crystals, m. 180-2°. Trimethyl ether, C₁₄H₁₀O₃N₂, m. 134°. PhN₂Cl reacts with *p*-hydroxybenzylhydantoin (III) to form orange needles, C₁₀H₁₀O₄N₄, which m. 225°. The probable formula: PhN:N(C₆H₃(OH)CH₂CH.CO.NH.CO.NH). The sodium salt of III, C₁₁H₈O₄N₂Na₂·5H₂O, forms flat, prismatic crystals from alc.

C. J. WEST

The constitution of the cinchona alkaloids and their synthesis. E. LÉGER. *pharm. chim.* [7] 23, 274-80, 321-8, 383-9 (1921).—A detailed review. "The synthesis of the cinchona alkaloids, and of quinine in particular, is an event whose realization is imminent."

F. F. HEYROTH

Constitution of aleuritic acid (WOLFF) 26. Preparation of citric acid by molybdenum (GANASSINI) 16. Silicon hydrides. IX. Reactions with alkali metal (STOCK, SCHMIESKI) 6. The chlorination of methane in stages and the valence energy in the chloromethanes (MARTIN, FUCHS) 2. Some physical properties of hydrocarbons containing two and three carbon atoms (MAASS, WRIGHT) 2. Estimation of the methoxyl group (TROEGER, TIEBE) 7.

HENRICH, F.: *Theorien der organischen Chemie*. Braunschweig: Friedr. Vieweg and Sohn. 536 pp. M. 68. For review see *Z. physik. chem. Unterricht* 43, 140 (1921)

Methane. FARBERKE VORM. MEISTER LUCIUS AND BRÜNING. Brit. 161,922 Aug. 10, 1920. Addition to 146,110 (C. A. 14, 3428). The process described in the principal patent for manufg. methane from CO and H is modified by dilg. the mixt. with gases that are indifferent to the process in order to regulate the temp. of the reaction more particularly in the earlier stages. The diln. may be effected by employing a quantity of H, as compared with CO in excess of the proportion 1:5; or the gases may be diluted with methane, which may be derived from the process itself. In the latter case

the gases may be repeatedly passed through a single contact furnace, the H_2O and a proportion of the highly concd. methane being withdrawn after each passage, while to the entering gases are added quantities of CO and H equiv. to the methane withdrawn, the relative proportions of CO and H in the reaction gases being maintained at about 1:5; the last traces of H in the methane may be subsequently removed.

Naphthylenediamine derivatives. G. T. MORGAN and GUILDS TECHNICAL COLLEGE, and IMPERIAL TRUST FOR THE ENCOURAGEMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH. Brit. 160,853, Aug. 6, 1919. The arylsulfonyl or arylenedisulfonyl derivs. of α -naphthylenediamine or its sulfonic acids are prepd. by reducing the *p*-azo derivs. of arylsulfonyl- α -naphthylamines or arylenedisulfonylbis- α -naphthylamines or their sulfonic acids containing the sulfonic radical in the 2, 6, 7, or 8 position with respect to the arylsulfonylamino or arylenedisulfonylamino radical. According to the provisional specification, these substances may also be prepd. by reduction of the corresponding *p*-nitro compds. The following reducing agents are mentioned as suitable: Zn dust and NaOH, Zn dust and NH_4Cl , Fe borings and dil. acids, alk. $Na_2S_2O_4$, alk. Na_2S , $SnCl_2$, and $TiCl_3$. The *p*-azo derivs. above mentioned are produced by condensing α -naphthylamine or its sulfonic acids in the positions specified with arylsulfonyl acid chlorides or arylenedisulfonyl acid chlorides and causing the resulting compds. to react with diazonium compds. in alk. media. Examples are given of the prepn. of toluene-*p*-sulfonyl-1,4-naphthylenediamine and its 8-sulfonic acid, benzene-1,3-disulfonylbis-1,4-naphthylenediamine and its 8-sulfonic acid, and naphthalene-2,6-disulfonylbis-1,4-naphthylenediamine.

α -Naphthylaminedisulfonic acids. SOUTH METROPOLITAN GAS CO. and H. STANIER. Brit. 161,859, May 25, 1920. 1,4,8-Naphthylaminedisulfonic acid is sepd. from the isomeric acids, principally the 1,3,8-acid, by taking advantage of the relative insoly. of the normal Ba salt in hot H_2O . The 1,4,8-acid is then sepd. from the remaining acids by taking advantage of the sparing soly. in hot H_2O of its acid Ba salt. According to the process, a soln. of a Ba salt is added to a concd. soln. of the crude disodium salts of the acids resulting from the process of prepn. described in 4625, 1888, or a soln. of the acids themselves is boiled with $BaCO_3$, oxide or hydroxide, whereby the normal Ba salt of the 1,4,8-acid is pptd. The filtrate is acidified, when the acid Ba salt of the 1,3,8-acid is thrown down. The resulting Ba salts can be converted into other salts by double decompn. A preliminary purification of the soln. of the crude disodium salts may be effected by adding acid to ppt. the acid sodium salts and then neutralizing these before treatment with the Ba salt; or the acid sodium salts may be suspended in H_2O , acid then added, and the soln. boiled with $BaCO_3$ for the sepn. treatment. The process may be applied to the purification of individual salts of the 1,4,8- and 1,3,8-acids.

Hydroxyaldehydes. SOC. CHIMIQUE DES USINES DU RHÔNE, ANCIENNEMENT GILLIARD, P. MONNET, ET CARTIER. Brit. 160,765, Feb. 24, 1921. Aromatic hydroxyaldehydes or their derivs. are prepd. by condensing a phenol or its derivs. with an ester or an ether of the hypothetical glycol $CH_2(OH)_2$ in the presence of an aromatic nitroso compd. Examples are given of the prepn. of vanillin from guaiacol, with methylal, methylene chloride, methylene diacetate and methylene sulfate as the glycol compd.

Hydroxyaldehydes. G. B. ELLIS. Brit. 161,679, Jan. 13, 1920. Hydroxyaldehydes are prepd. by the interaction of phenols or their derivs. with $HCHO$ in the presence of a nitroso compd. and a condensing agent. The prepn. of vanillin by treating guaiacol and $HCHO$ with *p*-nitrosodimethylaniline is described; while anisol aldehyde, pyrocatechuic aldehyde, *p*-hydroxybenzaldehyde, and salicylic aldehyde are referred to. The nitroso compds. specified are nitrosobenzene, nitrosonaphthalene, and *p*-nitrosodimethylaniline; HCl is mentioned as condensing agent. Cf. 139,153 (C. A. 14, 1835).

Secondary butyl alcohol. C. WEIZMANN and D. A. LEGG. Brit. 161,501, Feb.

24, 1916. $\text{MeCH}_2\text{CHMeOH}$ is prepd. by dissolving liquefied (MeCH_3) in a strong acid and distg. the soln.; suitable acids are H_2SO_4 , H_3PO_4 , and benzenesulfonic acid.

11—BIOLOGICAL CHEMISTRY

HATTIE L. HEFT, EDGAR G. MILLER, JR. AND WILLIAM J. GIES

A—GENERAL.

FRANK P. UNDERHILL

Heat-secretin. A. BICKEL AND C. VAN EWYK. *Sitz. preuss. Akad. Wiss.* 17, 325-7(1921).—The material obtained by the HCl hydrolysis of casein, if subsequently heated to 155-65°, caused a copious secretion of gastric juice when injected into fasting dogs with Pavlov stomachs. Dried egg yolk, heated at 130°, hydrolyzed with HCl at 100°, and again heated 3 hrs. at 130° in an autoclave produced, when injected, a flow of stomach juice. Egg yolk not heated but merely hydrolyzed with HCl at 100° showed no secretin action. The authors suggest that this substance, which is produced by the action of heat, be called "heat-secretin."

A. L. BARKER

A curious modification of amygdalinase and amygdalase due to aging. GABRIEL BERTRAND AND ARTHUR COMPTON. *Bull. soc. chim.* 29, 229-37(1921).—The authors have observed a change in the optimum reaction, that is, a change in the H^+ concn. most favorable for the diastatic action. These two diastases, prepd. from almonds, show optimum activity in a medium distinctly alk. to phenolphthalein. In these expts. a prepn. several months old was used. At a concn. of 5 mg. in 4 cc., the acidity was $10^{-5.5}$ as detd. colorimetrically with *p*-nitrophenol. Five mg. of this prepn. was allowed to act on 0.622 g. in a vol. of 33 cc., for 2 hr., at 57°. The acidity was varied by adding NaOH or H_2SO_4 between limits of 3.6 cc. 0.01 *N* alk. and 0.7 cc. 0.01 *N* acid. The extent of hydrolysis was measured by the detn. of HCN and also the reducing power of the soln. Detns. were made in Dec. 1910, July 1912, July 1914 and Feb. 1920. In the meantime the enzyme was kept in a well stoppered bottle sheltered from the light. In 1920 its acidity was $10^{-5.5}$. The optima were: 1910, 70% with 0.6 cc. 0.01 *N* NaOH; 1912, 65% with 0.1 cc. alk.; 1914, 60% between neutral and 0.1 cc. acid; and 1920, 51% at about the same acidity as 1914. The optimum moves towards a higher concn. of H^+ rapidly at first and then more slowly. The change may be due either to an increasing resistance of the complementary activator to the destructive action of the H^+ , a lesser activation of the H^+ with respect to the glucoside, or both simultaneously.

I. D. GARARD

A red pigment isolated in the pure condition from normal human urine by the use of *p*-dimethylaminobenzaldehyde. PAUL HARI. *Biochem. Z.* 117, 41-54(1921).—The compd. H. isolated from the urine is not identical with the pigment which gives the strong aldehyde reaction in certain pathological urines. Ten to 15 l. of fresh urine which had not had any preservative added were evapd. on the water bath to $\frac{1}{4}$ or $\frac{1}{10}$ the original vol. The salts that sepd. out were removed and the soln. was pptd. with 20% Pb acetate and the ppt. filtered off. The yellow filtrate was heated up to boiling, removed from the flame and immediately mixed with a 2.5% soln. of *p*-dimethylaminobenzaldehyde in 25% HCl. On the addition of this mixt. the urine becomes more or less yellow-red in color and the reagent is added until no darker coloration occurs. The product is cooled under running H_2O , sepd. from pptd. Pb compds. and treated with NH_3 when the coloration becomes an intense wine-red. When a slight turbidity occurs on the addition of the concd. NH_3 , dil. NH_3 is carefully added till a red-brown flocculant ppt. is formed. Too much NH_3 must be avoided. The ppt. is filtered off on hardened filter, and dissolved in 96% alc. From now on the material must be worked up in diffuse.

light, by dilg. with H_2O till turbidity appears and allowing the mixt. to stand in the dark and evap. under certain detailed precautions. The resultant product is cryst. and sol. in alc. to a clear red which changes to yellow on the addition of acid. It is insol. in H_2O . $CHCl_3$, Et_2O , and C_6H_6 solns. are yellow to orange. The m. p. is between 215 and 225°. The color of the alc. soln. fades rapidly in the sunlight. When the compd. is heated in a vacuum drier to 60 or 80° it is not decompd. Spectral examn. of several preps. showed that in all cases the same compd. was obtained. The sp. extinction coeff. is 118 for the recrystd. product. Consequently, H. considers that he has isolated the substance in pure condition.

F. S. HAMMETT

The effect of neutral salts on the heat coagulation of plant protoplasm. HUGO KAHN. *Biochem. Z.* 117, 87-95(1921).—The influence of neutral salts on the heat coagulation of the protoplasm of the epidermis cells of *Tradescantia zebrina* is of greater or less significance according to the salt since an additive effect is frequently produced from the fact that both ions are active. The anion of the alkali salts is more pronounced in its effect than is the cation and they facilitate coagulation according to the lyotrope series (cation K): $CNS > Br > I > NO_3 > Cl > tartrate > acetate > citrate > SO_4$. The cation effect follows the series K, $NH_4 > Na$, Li, Ca > Mg, Ba, Sr. This facilitation of coagulation is attributed to the permeability of the plasma membrane for these so-called neutral salts. Those which exhibit the most rapid permeability lower the coagulation temp. the most.

F. S. HAMMETT

The influence of neutral alkali salts on diastatic enzymes. III. AMANDUS HAHN AND RUDOLF MICHALIK. *Z. Biol.* 73, 10-8(1921); cf. *C. A.* 15, 1537.—The action of a dried pancreatic prepn. on a substrate of a 1.5% sol. starch, in the presence of 0.25 N NaCl, KCl, Na_2SO_4 , K_2SO_4 , $NaNO_3$, and KNO_3 , was studied when buffered to various H-ion concns. by appropriate phosphate or acetate mixts. The optimum reaction for the pancreas diastase is apparently at a $p_H = 7.10$ in the phosphate mixt. and at $p_H = 5.50$ when an acetate buffer is used. This optimum is changed somewhat by the various salts studied. On the alk. side of the optimum, at a $p_H = 8.18$, chlorides favor the action of the diastase, but this decreases with increasing concn. of buffer. The sulfates at this reaction are completely inactive, while the nitrates facilitate at the lower, and retard the diastatic activity at the higher concns. of buffer. On the acid side of the optimum, $p_H = 5.99$, chlorides and sulfates favor enzyme action when the concn. of the buffer is low, when this is increased they retard. Nitrates retard diastatic action at this reaction in all concns. of buffer. Pptn. expts. are given which support the idea that the retarding effect of salts on diastatic activity is due to an increase in the size of the colloidal particles, while when enzyme action is stimulated the colloidal particles have become more disperse.

F. S. HAMMETT

Action of sodium hydroxide upon coagulation of fibrinogen. J. O. W. BARRETT. Lister Inst., London. *Biochem. J.* 15, 4-10(1921).—The retarding effect that NaOH has in the coagulation of fibrinogen by thrombin is due to the fact that the alkali, added in increasing amts. to citrated plasma, causes the gradual disappearance of fibrinogen from the plasma. No evidence was obtained to show that the alkali has any effect on the thrombin.

B. HARROW

The production of carbon monoxide by the action of alkaline hypohalites on urea. W. H. HURLLEY. St. Bartholomew's Hosp. *Biochem. J.* 15, 11-18(1921).—H. has verified Krogh's assertion that when NaBrO acts on urea (in the urine, in the cerebrospinal fluid, or in aq. soln.) CO as well as N is produced (see *C. A.* 7, 2406). To demonstrate the presence of this CO, the gas from 10 cc. of a 2% soln. of urea and 50 cc. of hypobromite is collected in a nitrometer. From here the gas is passed into a 150 cc. narrow-necked cylinder filled with suitably dild. blood and inverted in an evapg. basin contg. the same. The gas is collected, the stopper inserted, and the cylinder well shaken. A 50 cc. Nessler glass is now filled to the mark with blood from the cylinder and a similar

glass is filled to the mark with some of the original dild. blood. The difference in color is very marked. The amt. of CO contained in the N when NaOBr of the usual strength acts upon 2% soln. of urea is 0.7% of the total gas. CO is also produced along with N when NH_3 or NaOH acts upon dichlorocarbamide, and when NaOBr of suitable strength acts upon semicarbazide, hydrazodicarbonamide, azodicarbonamide, and acetylcarbamide.

BENJAMIN HARROW

Extraction of melanin from skin with dilute alkali. W. J. YOUNG. Australian Inst. Tropical Medicine. *Biochem. J.* 15, 118-22(1921).—The skins of two Australian aborigines and a low-cast Cingalee were used. These were soaked in boiling water and the outer layer was removed by scraping. 200 g. of this layer was washed with alc. and ether, and boiled with 100 cc. of 0.05 N NaOH for 1 hr. under a reflux. The liquid was decanted and filtered and the residue again submitted to a fresh portion of 0.05 N NaOH. This was repeated 4 times. The melanin was thrown down by the addition of HCl until the soln. was about N/3. Subsequent treatment and purification depended upon the fact that a portion of the ppt. was sol. in 0.05 N acid on boiling (acid-sol.) and another portion insol. (acid-insol.). The latter could be purified by dissolving in alkali and pptg. with acid. Analyses of the purified products showed that the acid-sol. pigment generally contained a lower percentage of carbon and a greater percentage of nitrogen and hydrogen than the acid-insol. pigment subsequently extd. from the same skin. Continued boiling with dil. alkali converted the pigment sol. in acid to one insol. in acid; it seems, therefore, probable that in extg. the pigment even with very dil. NaOH (0.05 N) it is gradually decompd., losing N and H, and gradually changed to a pigment insol. in acid. This melanin of black skin resembles that prepd. from wool by Gortner (*C. A.* 5, 302).

BENJAMIN HARROW

Researches on photodynamic phenomena. I. Origin and conditions in photodynamic phenomena. G. VIALE. *Arch. sci. biol.* 1, 78-89(1919); *Physiol. Abstracts* 5, 113(1920).—All fluorescent substances are photodynamically active, and this activity may be either biological or chem. A given fluorescent substance does not produce all photodynamic reactions, but will give rise to at least one biological and one chem. reaction. Neither fluorescence nor photoelec. phenomena (emission of electrons in the light) can produce a biological photodynamic action in the absence of O_2 ; therefore, such action in the living organism must be by a process of oxidation. The photodynamic action of a fluorescent substance is apparently governed by its penetration within the cell. Biologically active substances are lipoidolytic; and the photodynamic action, therefore, is intracellular.

JOSEPH S. HERBURN

Distribution of sodium salts in plant and animal cells. S. FUNCOKA. *Kyoto Igaku Zasshi* 15, No. 1, 85-120(1918); *Jap. Med. Literature* 6, 2(1921).—Na may be detected by pptn. as a double sulfate with Ce, or as a triple acetate with Mg and UO_2 ; a negative result does not exclude the presence of Na. By these and other reactions, Na was found in the blood plasma of both vertebrates and invertebrates, but not in their erythrocytes. It was present in the lymph of muscles but not in their fibers. Na occurred in the ground substance of cartilage but not in the cells themselves. In other tissues, it was detected in the intercellular substance but not in the cells. In plants, Na was found in the cell plasma, but not in the nucleus or the chlorophyll bodies.

JOSEPH S. HERBURN

Sensibilization to radioactivity by the action of hormones. H. ZWAARDEMAKER. *Proc. Acad. Sci. Amsterdam* 23, 838-41(1921); *Verslag Akad. Wetenschappen Amsterdam* 29, 390-3(1921).—The heart of a cold-blooded animal, such as the frog or the eel, beats only when the circulating fluid contains a radioactive compd. (emitting either α or β rays) in the proper dosage. If a compd. producing α rays, and one producing β rays be applied simultaneously, their amts. may be so adjusted that their respective effects neutralize each other, and the heart ceases to beat; its action is re-

stored by a slight excess of either type of ray. The required dosage of compd. producing either type of ray is less in summer than in winter. When the equil. has once been attained, it may be shifted and the beating of the heart may be restored by addition of certain inorg. compds. such as those containing the Ca ion, or of certain org. compds. or hormones such as choline and adrenaline. In the presence of one of the latter compds., the amt. of K required to maintain the beating of the heart may be reduced to one-half or less of that usually necessary. Choline shifts an equil. between K and U toward the K (β ray) side, adrenaline toward the U (α ray) side. The bioradioactivity of K has no temp.-coeff., being the same at 4°, 10°, and 20° with respect to both velocity of effect and dosage. Physiol. radioactivity is analogous to, but not identical with, photochem. actions. It may be assumed that "the charged particles which send the radioactive radiation with great velocity through the lipid films on the surface of the cells, evoke inside the cells a catalytic effect, which we usually call a stimulus."

JOSEPH S. HEPBURN

Relation between the growth of cells and the production of enzymes. JEAN EFFRONT. *Réunion soc. belge biol.* 1920, 194-5; *Physiol. Abstracts* 5, 172.—A close relationship normally exists between the development and growth of living cells and their ability to produce enzymes. However, if beer yeast be cultivated in a medium markedly alk. with NaHCO_3 , reproduction ceases, but alcoholic fermentation of sugar proceeds very actively. Abundant production of enzymes occurs without development of cells.

JOSEPH S. HEPBURN

Mechanism of the anticoagulating action of hirudine. A. GRATIA. *Réunion soc. belge biol.* 1920, 311-3; *Physiol. Abstracts* 5, 180.—The antagonistic action of hirudine may be exerted at several stages of the coagulation of the blood. Hirudine can retard indefinitely the transformation of proserozyme into serozyme, can markedly retard the reaction between serozyme and cytozyme which produces thrombin, and can function as an antithrombin and neutralize the thrombin when the latter is formed. Hirudine does not actually neutralize cytozyme.

JOSEPH S. HEPBURN

Reciprocal neutralization of hirudine and thrombin. A. GRATIA. *Réunion soc. belge biol.* 1920, 313-4; *Physiol. Abstracts* 5, 180.—Hirudine and thrombin neutralize each other reciprocally, forming an inactive colloidal complex which is quite stable, but may be destroyed with the regeneration of hirudine by heating at a temp. of 56°. While fresh thrombin neutralizes hirudine to form an inactive stable complex, aged thrombin lacks this power.

JOSEPH S. HEPBURN

Nature and genesis of the coagulating agent of staphylococci.—Staphylocoagulase. A. GRATIA. *Réunion soc. belge biol.* 1920, 584-5; *Physiol. Abstracts* 5, 180.—Staphylococci, like thrombin, coagulate plasma which cannot coagulate spontaneously on account of treatment with oxalate, salts, hirudine, or peptone. If they be sown on oxalated plasma which has been filtered and treated with phosphate, and hence is free from Ca, cytozyme, and serozyme, they produce coagulation. When coagulation is produced by these microorganisms, the antithrombin is not neutralized and is found intact. The specific affinity, which exists between thrombin and antithrombin, does not exist between the coagulating enzyme of staphylococci and antithrombin. The enzyme of the microorganisms is totally different from thrombin in both nature and genesis, and is designated staphylocoagulase.

JOSEPH S. HEPBURN

Influence of the medium upon the production of staphylocoagulase. A. GRATIA. *Réunion soc. belge biol.* 1920, 585-7; *Physiol. Abstracts* 5, 180.—Staphylococci from a gelose culture contain little or no staphylocoagulase, but produce that enzyme in plasma cultures, drawing the necessary nutritive elements from the plasma.

JOSEPH S. HEPBURN

Transformation of fibrinogen to fibrin by staphylococci. A. GRATIA. *Réunion soc. belge biol.* 1920, 649-51; *Physiol. Abstracts* 5, 180.—Expts. show that staphylococci

coagulate peptone plasma by converting the fibrinogen into fibrin without the intervention of thrombin and its precursors. Therefore, the microorganisms do not exert a thromboplastic action. These expts. also demonstrate that the production of thrombin is independent of coagulation, since staphylococci produce coagulation without formation of thrombin in a medium (plasma) in which the precursors of that enzyme are present in abundance but are kept inactive by the antithrombin. J. S. H.

Study of trypsin. V. MASAI. *Tokyo Igakkwai Zasshi*, 32, No. 10; *Sei I Kwai Med. J.* 37, No. 9 (1918); *Jap. Med. Literature*, 6, 20(1921).—The activity of pancreatic trypsin was increased by the presence of erepsin from the urine, yeast, or the intestine.

JOSEPH S. HEPBURN

Lecithin. III. Fatty acids of lecithin of the egg yolk. P. A. LEVENE AND IDA P. ROLF. Rockefeller Inst. *J. Biol. Chem.* 46, 193-207(1921).—The findings of previous investigators regarding the fatty acids present in lecithin may be explained on either one of two alternative assumptions: first, that several lecithins exist or second, that lecithin contains only oleic and palmitic acids and that the linolic and stearic acids found by some originated in cephalin present in all crude lecithins. Levene and Ingvaldsen (*C. A.* 14, 3646) found stearic acid and a homolog of linolic acid in a pure lecithin free from cephalin derived from liver. The problem of the fatty acids of lecithins freed from all traces of cephalin has been reinvestigated, lecithin derived from egg yolk being used. Reports of the work on lecithin obtained from other organs will be presented later. Egg yolk lecithin contains only one unsatd. acid, oleic, and two satd. acids, palmitic and stearic. The satd. and unsatd. acids are present in equimol. proportions, indicating the existence of more than one lecithin in egg yolk. The CdCl_2 salt was used in most of the expts. "An objection to the conclusion might be found in the assumption that the CdCl_2 product contained impurities which were not cephalin. To meet this objection hydrolyses were made on a smaller sample of dihydrolecithin prepd. from the Cd salt free from cephalin, and also on a smaller sample of free lecithin prepd. from the same material. The results obtained from these expts. are confirmatory of those based on the analysis of the CdCl_2 derivative." A. P. LOTHEOP

The effect of age on pancreatic enzymes. FREDERIC FENCER AND MARY HULL. Chicago. *J. Biol. Chem.* 46, 431-5(1921).—The dried, fat-free, powdered preps. of hog pancreas were prepd. according to the methods previously described (*C. A.* 13, 2911) and were stored in well stoppered but only partly filled amber-colored bottles at room temp., conditions comparable to those occurring in commerce. The second tests were made after the samples had stood for 12 months and their activity was compared with the original activity of the freshly prepd. material. Loss in diastase occurred ranging from about 50% to almost complete inactivity, the greatest loss occurring in samples in which attempts had been made to activate the proteolytic enzyme by duodenal mucosa. The lipase deteriorated with great irregularity, the loss varying from 10 to 90%. The proteolytic activity of all preps. remained practically unchanged at the end of the year. This stability is similar to that of the gastric proteolytic enzyme. The authors have, in their lab., a 7-yr.-old sample of scale pepsin and a 5-yr.-old pancreas prep. in which no perceptible loss of proteolytic power has occurred. A. P. LOTHEOP

Nitrogen distribution of the proteins extracted by dilute alkali from pecans, peanuts, kafir, and alfalfa. C. T. DOWELL AND PAUL MENAUL. Okla. Agr. Expt. Sta. *J. Biol. Chem.* 46, 437-41(1921).—"Advantage has been taken of the fact that all proteins are sol. in basic soln. to sep. them from the other substances in foods and feeds which make it impractical to apply the Van Slyke method to det. the N distribution. It was found that the proteins of pecans and peanuts could be extd. practically completely by dil. solns. of NaOH and $\text{Ba}(\text{OH})_2$, and pptd. from the alk. soln. with AcOH . In the case of kafir and alfalfa the extn. was not so complete nor were the pptd. proteins as pure as in the case of pecans and peanuts. However, since all the

proteins were sol. in alkali, it seems reasonable to suppose, that if the material was finely ground, the part of the proteins which was extd. was a representative sample of the total. It would seem that it is much more important to det. the amino-acid compn. of a food or feed than it is to isolate and analyze their individual proteins." The following av. % distribution of N was found in the proteins of pecans, peanuts, alfalfa and kafir, resp., humin 5.58, 1.2, 7.8, 4.4; arginine 23.39, 17.57, 11.01, 2.41; histidine 3.96, 1.88, 6.26, 1.78; lysine 5.62, 6.22, 5.26, 1.05; cystine 0.8, 0.77, 0.85, 0.96; monoamino N 52.1, 61.25, 53.53, 74.95; humin 5.58, 1.2, 7.8, 4.4. In the case of kafir the best solvent was found to be a 0.5% soln. of NaOH in 70% alc. In the case of the substances mentioned, extrn. of the proteins with dil. alk. solns. makes it possible to det. the amino-acid compn. correctly by means of the Van Slyke method, but further work is necessary to det. whether such a procedure can be applied to all classes of food and feed substances.

A. P. LOTHROP

The basic amino acids of glycinin, the globulin of the soy bean, *Soja hispida*, as determined by Van Slyke's method. D. BREESE JONES AND HENRY C. WATERMAN. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* **46**, 459-62(1921).—Glycinin, the globulin of the soy bean, contains the following % of basic amino acids: arginine 8.07; cystine 1.18, histidine 1.44, lysine 9.06, NH_2 2.28, tryptophan 1.37. The material used contained 16.94% of N, and the % of the basic amino acids were calcd. on the moisture- and ash-free basis. The value for tryptophan was calcd. from the total humin N according to the observation of Gortner and Blish that 86.5% of the tryptophan N is converted into humin N in an acid hydrolysis in the presence of carbohydrate; no carbohydrate other than that in the prepn. was present during the hydrolysis so that the figure (1.37%) should be regarded as minimal. The detn. of the monoamino acids of glycinin is in progress and an attempt to isolate tryptophan in a sep. hydrolysis, with alkali, or with trypsin will be made.

A. P. LOTHROP

Recovery process of excitable tissues. L. E. D. ADRIAN. Cambridge. *J. Physiol.* **54**, 1-31(1920).—To account for the phenomena noted in the recovery process of nerve and of muscle it is suggested that the excitability, conductivity and contractile power are the greatest when the colloidal particles which form the membranes of the tissues are initially uncharged, that a fluid on the acid side of the isoelec. point produces a small + charge and that activity produces a — charge. As this — charge subsides the instability of the tissue increases and reaches its highest value when the surface is isoelec. If the tissue is in an acid fluid the surface must pass through the isoelec. point and end up with a small — charge, whereas in an alk. fluid the iso elec. point is never reached and therefore the excitability never rises above its resting value.

J. F. LYMAN

The relation of the animal cell to electrolytes. II. The adsorption of hydrogen ions by living cells. J. GRAY. Cambridge. *J. Physiol.* **54**, 68-78(1920); cf. *C. A.* **14**, 2497.—When living trout eggs are exposed to abnormally high concns. of electrolytes there is positive evidence of the uptake of H^+ or OH^- only. In dil. solns. of HCl the H^+ is taken up but the concn. of Cl^- in the external soln. remains practically unchanged. To replace the H^+ removed from soln. a cation is given up by the eggs. The uptake of the H^+ by the cell follows the laws of an adsorption process. The equil. between the external soln. and the cell is apparently established by means of the outer membrane of the cell. This process constitutes Loeb's membrane effect. J. F. LYMAN

The permeability of the epithelial layer of the bladder to water and salt. R. SjöÖrn. Univ. College, London. *J. Physiol.* **54**, 239-43(1920).—The epithelial layer of the bladder in a living animal is permeable to H_2O and to NaCl under physiol. conditions. J. F. LYMAN

Nitrite methemoglobin and related pigments. H. HARRYDGE. Cambridge. *J. Physiol.* **54**, 253-9(1920).—There is evidence that nitrite methemoglobin is a definite

chem. compd., and not a mixture of methemoglobin and nitric oxide hemoglobin. (1) Mixtures of certain pigments in different proportions did not match the color and spectra of nitrite methemoglobin. (2) Reagents, which would be expected to act differently on various constituents if these were present, and therefore to modify the appearance of the absorption bands, were not found to bring about such a change. (3) Nitric oxide hemoglobin is not a constituent, for if nitrite methemoglobin be converted into CO hemoglobin by the action of CO and $(\text{NH}_4)_2\text{S}$, the CO bands are found to occupy their normal position. (4) Methemoglobin has been found to behave like an indicator over the range p_{H} 8 to 9. Below 8 methemoglobin shows the spectra and color of neutral methemoglobin, above 9, on the other hand, those of alk. methemoglobin are given. Between 8 and 9 both pigments exist side by side in the soln., their relative amts. varying with the reaction.

J. F. LYMAN

The temperature coefficient of the velocity of a nervous impulse. A. V. HILL. *J. Physiol.* 54, 332-4(1921).—H. points out that the nervous impulse consists of 2 separate things (a) a chem. change at a given point and (b) the transmission of that change to a neighboring point. At present we are ignorant of the relative importance of the 2 phases. The temp. coeff. of 1.79, found by Lucas (*J. Physiol.* 37, 112), for the velocity of propagation is higher than that of most phys. changes. It may be concluded, therefore, that a chem. change interposes somewhere in the process and that this change occupies a large part of the time of propagation. Expts. are described on the effect of temp. on the rate of burning of a powder fuse. The temp. coeff. in this process is only 1.006 to 1.019.

J. F. LYMAN

The distribution of iodine between the cells and colloid in the thyroid gland. III. The effect of stimulation of the vago-sympathetic nerve on the distribution and concentration of iodine in the dogs thyroid gland. H. B. VAN DYKE. Univ. Chicago. *Am. J. Physiol.* 56, 168-81(1921); cf. *C. A.* 15, 890.—Periodic stimulation of the isolated vago-sympathetic nerve by an induced current of moderate to strong intensity over a period of from 3 to 3.5 hours does not appreciably alter the distribution ratio of I between the cells and colloid.

J. F. LYMAN

Hydration effects of amino compounds. D. T. MACDOUGAL AND H. A. SPOHR. Desert Lab., Tucson, Arizona. *Proc. Soc. Exptl. Biol. Med.* 17, 33-6(1919).—The pentosans are abundantly present in plant cells, presumably intimately interwoven into its colloidal mesh, and undergo metabolic changes in the plant but slowly. They must show changes in vol. and form according to the colloidal structure in which they occur and to the nature of the soln. penetrating them. Amino compds. furnish the only known solns. in which agar and other pentosans or mucilages undergo a greater hydration than in distd. H_2O . The swelling or hydration of these substances in the amino acids, which dissociate strongly, as aspartic acid, which shows a p_{H} of 3 at 0.01 *M*, is less than in H_2O ; but in such acids and amino compds. as asparagine, alanine, phenylalanine, glycocoll, NH_4OH , and ethylamine, which dissociate more weakly, the pentosans showed swellings greater than in distd. H_2O . The pentosans and the albuminous compds. are intimately intermixed in the protoplast of the plant and in the nucleus of the animal cell. The effect of the H^+ is to increase the hydration capacity of albumin and its derivs., while lessening the hydration of the carbohydrates. In addition to these differential effects of the solns. upon the principal components of the plasmatic colloids, changes in vol. may be detd. by the manner in which the mesh, masses of colloid material, are laid down. These 2 classes of variables may be considered as prolific sources of differentiation in the procedure of the cell.

V. C. MYERS

Outline of a classification of the lipoids. W. R. BLOOR. Univ. of California. *Proc. Soc. Exptl. Biol. Med.* 17, 138-40(1920).—The following classification is believed to be an improvement on preceding ones in that it provides a definite chemical and metabolic basis which has hitherto been lacking. *The lipoids.*—The higher fatty acids.

their naturally occurring compds. and certain substances found naturally in chem., assocn. with them. The group is characterized in general by insoly. in H_2O and soly. in "fat solvents"—ether, $CHCl_3$, C_6H_6 , etc. *A.—Simple lipoids.*—Esters of the fatty acids with various alcs. 1. *Fats.*—Esters of the fatty acids with glycerol (those which are liquid at ordinary temperatures are called oils). 2. *Waxes.*—Esters of the fatty acids with alcs. other than glycerol. Beeswax, lanolin, cholesteryl oleate. *B.—Compound lipoids.*—Compds. of the fatty acids with alcs. but containing other groups in addition to the alc. 1. *Phospholipoids.*—Substituted fats containing H_3PO_4 and N, lecithin, cephalin, etc. 2. *Glycolipoids.*—Compds. of the fatty acids with a carbohydrate and N but containing no H_3PO_4 , cerebrin, etc. (Aminolipoids, sulfolipoids, etc.—various groups which may be added as soon as they are sufficiently well characterized.) *C.—Derived lipoids.*—Substances derived from the above groups by splitting, which have the general properties of the lipoids. 1. *Fatty acids* of various series. 2. *Sterols.* Alcohols, mostly large molecular solids, which are found naturally in combination with the fatty acids and which are sol. in "fat solvents." Cetyl alc. ($C_{18}H_{38}OH$), myricyl alc. ($C_{21}H_{42}OH$), cholesterol ($C_{27}H_{46}OH$), etc. V. C. MYERS

Studies in salt action. III. The effect of hydrogen-ion concentration upon salt action. I. S. FALK. Yale Univ. School of Med. *Proc. Soc. Exptl. Biol. Med.* 17, 210-1 (1920).— H^+ concns. above $pH=6.0$ or below $pH=7.0$ give a much more rapid death rate than a pH between these limits. Therefore, careful control of H^+ concn. is essential before valid conclusions can be drawn as to the influence of electrolytes. It is necessary also to follow the changes which go on in a suspension of living and dead cells, since a bacterial suspension in 5 isotonic NaCl soln. quickly reverts to a pH of about 7.2, regardless of the initial pH . V. C. MYERS

Light catalytic processes of physiological importance. KURT NOACK. *Z. Botan.* 12, 273-349(1920).—The chem. action of light on cells occurs through the agency of substances which transform light energy into chem. energy. Two groups of such catalysts are recognized: fluorescent org. compds., and salts of certain heavy metals. Both serve as carriers of O. From expts. on chromogens and many plants N. concludes that the fluorescent org. compds. act by the formation of peroxides. Their action is stopped by Na_2SO_3 . The salts of the heavy metals act by change in the valence of the metal.

T. G. PHILLIPS

Methods of studying the respiratory exchange in small aquatic organisms, with particular reference to the use of flagellates as an indicator for oxygen consumption. H. MONRO FOX. Marine Biol. Assoc., Plymouth, Eng. and School of Medicine, Cairo, Egypt. *J. Gen. Physiol.* 3, 565-73(1921).—It has been shown that flagellates (*Bodo sulcalis*) are positively chemotropic to a certain concn. of O_2 dissolved in water and that this optimum concn. is lower than that present when water is satd. with O_2 at the atm. partial pressure. When a small aquatic animal is placed on a slide in a suspension of flagellates and covered with a cover slip, the flagellates are attracted to those parts of the animal which are absorbing O_2 . The relative sizes of the flagellate aggregations indicate the relative O_2 -absorbing activities of the different surfaces of the animal. A red *Chironomus* larva was tested by this method and the results showed that the whole body surface except the head and ventral gills respired, and that the relative intensity of O_2 intake of the different parts of the body varied in different individuals and in the same individual at different times. Since the red *Chironomus* larva contains hemoglobin, F. was able to show with the microspectroscope that the ventral gills did not absorb O_2 from the water, thus confirming the flagellate test. An indicator method was used to test the relative amts. of CO_2 given off by the body surfaces of aquatic animals. A soln. of hematoxylin with just enough alkali added to give it a bluish pink color was used. This soln. was added to the slide prepn. contg. the living animal, and in regions where CO_2 was given off, the bluish pink color changed through orange to yellow. The

color was sharp even in the thin layer of liquid surrounding the animal. Tests in which the animal emitted feces had to be rejected because such fecal fluids were alk. By this method, the red *Chironomus* was found to give off CO_2 over the entire body surface except at the head and ventral gills. CO_2 excretion was most abundant from the posterior abdominal segments. Differences in individuals and the same individuals at different times were noted. Cf. *C. A.* 15, 1765.

CHAS. H. RICHARDSON

The phagocytosis of solid particles. III. Carbon and quartz. WALLACE O. FENN. Harvard Med. School. *J. Gen. Physiol.* 3, 575-93(1921).—"The rates of ingestion of quartz and C particles by leucocytes, when both are in suspension in serum, was compared with the availability of the 2 particles as predicted from the calcd. chances of collision with the leucocytes, and it was shown that C is ingested about 4 times as rapidly as quartz." (See *C. A.* 15, 1906.) The same result was obtained by a film method by means of which phagocytosis could be followed microscopically. "The relative rates of ingestion of C and quartz depend upon the condition of the cells, the difference increasing as the phagocytic activity of the cells decreases." Cells from a marine sponge (*Grantia*) were found to ingest C particles about 3 times as readily as quartz. It is suggested that the cause of the more rapid ingestion of C may be identical with the cause of the greater instability of C suspensions, that is, the tendency of the C particles to clump together. If the potential energy of a C-serum surface were greater than the potential energy of a quartz-serum surface, it is probable that the leucocytes would take up the C particles more rapidly. This is also the condition which should cause more rapid clumping of C than of quartz particles, since clumping involves a decrease of surface. Literature is cited which shows that quartz carries a high elec. charge, while C is without an elec. charge. The stability of C and quartz in acid, alk., and neutral solns. was studied. The coagulation of quartz in the most effective concn. of HCl for coagulation was very slight; both quartz and C showed greatest stability in alk. and neutral solns. C was less stable than quartz in acid soln. and contrary to evidence from the literature it does carry a negative charge. It appears that bacteria, like solid particles, are more readily ingested when easily agglutinated. A bibliography of 23 titles is given.

CHAS. H. RICHARDSON

Studies on enzyme action. XIX. The sacrolytic actions of bananas. K. GEORGE FALK AND GRACE MCGUIRE. Roosevelt Hosp., N. Y. City. *J. Gen. Physiol.* 3, 595-609(1921); cf. *C. A.* 14, 749.—The general relations of unripe and ripe bananas were the same except that greater enzyme actions were found in ripe bananas and the nature and properties of unripe bananas rendered their manipulation more difficult and unsatisfactory. Unripe bananas contain sucrase, but no amylase; the same was true of ripe bananas. The optimum p_H for the action of sucrase was a zone between 3.5 and 4.5, corresponding with that for yeast and potato sucraes. The action is a linear function of the time, the amts. hydrolyzed being proportional to the time of action until practically all the sucrose was hydrolyzed. The action with 5% sucrose soln. was only slightly greater than with the 2.5% soln., indicating that the sucrase was nearly satd. in the more dil. soln. The total action was not twice as large in the 5% sucrose soln. as in the 2.5% soln., due to the accumulation of the products of the reaction. Both sol. and insol. sucraes were found; the latter was insol. in water and dil. NaCl soln. Sol. sucrase was converted into insol. sucrase by dialyzing against running water till a gel formed. This gel showed marked sacrolytic activity. It was prepd. by grinding with EtOH and Et₂O and drying at room temp. In this insol. condition, it was more active than the insol. sucrase obtained directly from the bananas.

C. H. R.

A theory of injury and recovery. III. Repeated exposures to toxic solutions. W. J. V. OSTERHOUT. Harvard Univ. *J. Gen. Physiol.* 3, 611-22(1921).—In previous papers, O. has developed a theory which enables one to predict the behavior of *Lammaria agardhii* when transferred from sea water to a toxic soln. and then replaced in

sea water. In this paper, expts. made on tissue exposed to several solns. in succession are described. The methods of expt. and calcn. have been given elsewhere (C. A. 14, 3681; 15, 540, 1765). The exptl. results agreed well with those calcd. from the formula. The behavior of the tissue under these conditions is thought to be due to a series of catenary reactions; it is possible that other fundamental life processes are susceptible of a like explanation.

CHAS. H. RICHARDSON

The significance of latency time in enzyme determinations. LOURENS G. M. BAAS-BECKING. Stanford Univ. *J. Gen. Physiol.* 3, 653-6(1921).—Various observers have noticed an increase or decrease in the reaction velocity of enzyme reactions. B. found that there was a latent period in catalase reactions, which in one case had a duration of 98 secs. while the reaction itself was completed in 2,058 secs. The formula, $K = 1/(t - t_0) \ln(a - x_0)/(a - x)$, in which x_0 is the amt. decompd. at a certain time T , gives const. values of K in catalase reactions, while the formula, $K = 1/t \ln a/(a - x)$ does not.

CHAS. H. RICHARDSON

Comparative studies on respiration. XVII. Decreased respiration and recovery. O. L. INMAN. Harvard Univ. *J. Gen. Physiol.* 3, 663-6(1921).—It has recently been shown (cf. C. A. 15, 1753) that exposure to hypotonic or hypertonic solns. may greatly lower CO_2 production in *Laminaria agardhii*. The investigation here reported was undertaken to discover whether respiration would become normal when the plant was replaced in sea water. In strongly hypertonic sea water, respiration steadily decreases, and the degree of recovery in the normal sea water depends on the length of exposure to the hypertonic sea water. After a 5-min. exposure, recovery is nearly complete, but following a 20-min. exposure there is no recovery. Recovery of tissue which had been exposed to strongly hypotonic sea water also depended upon the length of exposure. Tissue which was placed in hypertonic or hypotonic sea water died and disintegrated sooner than the normal tissue when replaced in normal sea water. Osterhout (C. A. 14, 3681) has observed a similar phenomenon in *Laminaria* when elec. cond. is used as the criterion of recovery. "It is possible that when recovery is incomplete none of the cells are killed but that their respiration is permanently decreased. It is also possible that some cells continue to respire normally while others are killed and that it is the death of these cells which prevents recovery. This question must remain for future investigation."

CHAS. H. RICHARDSON

Donnan equilibrium and the physical properties of proteins. I. Membrane potentials. JACQUES LOEB. Rockefeller Inst. *J. Gen. Physiol.* 3, 667-90(1921).—Neutral salts depress the potential difference (p. d.) which exists at the point of equil. between a gelatin chloride soln. contained in a collodion bag and an outside aq. soln. (without gelatin). The same neutral salt depresses the osmotic pressure of gelatin chloride in a similar manner. This depression in the p. d. can be calcd. by means of Nernst's formula on the assumption that the p. d. is due to a difference in the H-ion concn. on the opposite sides of the membrane. This difference in H-ion concn. is due to Donnan's membrane equil. There is also a p. d. between a solid block of gelatin chloride and the surrounding aq. soln. when equil. is reached. This p. d. is also depressed by the addition of neutral salts. The p. d., osmotic pressure, swelling and viscosity of gelatin solns. are similarly influenced by the H-ion concn. The p. d. at the boundary of gelatin chloride and water can also be calcd. from the p_{Cl} on the opposite sides of the membrane. This proves that Procter's formula (C. A. 9, 875), $x^2 = y(y + z)$, is the correct expression for the Donnan membrane equil. In this formula x is the concn. of H-ion and monovalent anion in the aq. soln., y the concn. of H-ion and anion of the free acid in the gelatin soln. and z the concn. of anion in combination with the protein. "The similarity between the variation of p. d. and the variation of the osmotic pressure, swelling and viscosity of gelatin, and the fact that the Donnan equil. detcs. the variation in p. d. raise the question whether or not the variations of the osmotic pressure, swelling

and viscosity are also detd. by the Donnan equil." Cf. *C. A.* 15, 1733. II. Osmotic pressure. *Ibid* 691-714.—The effect of p_H on the osmotic pressure of protein-acid salts was calcd. by assuming that the p_H effect was due to the unequal distribution of crystalloid ions on opposite sides of a collodion membrane. This is in accordance with Donnan's theory. The effect of valence can also be calcd. with a fair degree of accuracy by assuming that it is due to the influence of the valency of the anion of a gelatin-acid salt on the relative distribution of the free acid on both sides of the membrane. This is also in keeping with the demands of Donnan's theory. Two const. minor deviations in the curves of the observed values of osmotic pressure from the curves of the calcd. osmotic pressure are indicated.

CHAS. H. RICHARDSON

Application of the biochemical method of the study of glucose to the study of the products of fermentative hydrolysis of inulin. EM. BOURQUELOT AND M. BRIDEL. *Compt. rend.* 172, 946-9(1921); cf. *C. A.* 14, 2005.—One g. of glucose and 12 of fructose in 100 cc. of 70% MeOH were slowly hydrolyzed by emulsin. Before hydrolysis the liquid contained 12.686 g. of reducing sugar calcd. as glucose. After the action of emulsin 11.860 g. were found, or a diminution of 0.826 g. which is identical with the amt. of glucose hydrolyzed when emulsin acts upon 1 g. of glucose in 100 cc. of 70% MeOH (cf. Bourquelot and Verdon, *C. A.* 7, 2758, 2759, 3511). The substance formed as above has a rotatory power $\alpha_D = -32.28^\circ$ ($p = 0.237$, $v = 10$, $l = 2$, $\alpha = -1.53^\circ$), the figure for methyl glucoside being $\alpha_D = -32.5^\circ$. Fifteen g. of inulin from *Atractylis*, contg. 11% H₂O, were dissolved in water up to 300 cc. and added to 300 cc. of the liquid of *Aspergillus niger* (cf. Bourquelot, *J. pharm. chim.* 27, 498(1893)), and allowed to stand at ordinary temp. from Aug. 2 until Oct. 21. The liquid was then filtered and a rotation of -4.133° observed, which corresponded to 13.401 g. of reducing sugar in the 600 cc. The dry matter detd. in 5 cc. at 110° was 0.115 g. with a rotation $\alpha_D = -89.85^\circ$ ($p = 0.115$, $v = 5$, $l = 2$, $\alpha = -4.133^\circ$). The filtered liquid was evapd. to dryness under reduced pressure and taken up with 250 cc. of boiling 95% alc., cooled and decanted from the residue, the latter being further treated with 50 cc. of the alc. The alc. exts. were then united, evapd. to dryness under reduced pressure, and the residue dissolved in 70% MeOH up to 100 cc. This soln. contained 11.425 g. calcd. as glucose and was treated with 1 g. of emulsin and allowed to stand at ordinary temp. 74 days when it was found to contain the same amt. of sugar, or 11.425 g. Upon the hydrolysis of inulin by the inulase of *Aspergillus niger*, products are obtained with the same rotatory power as fructose d , and which do not combine with MeOH under the action of emulsin. By adding glucose to the methylic soln. of these products of hydrolysis, it is combined with MeOH in the same proportion as though only glucose was present. Accordingly inulin contains fructose but no glucose mols. L. W. RIGGS

Fundamental organic substance of amylopectin. SAMEC MAYER AND ANKA MAYER. *Compt. rend.* 172, 1079-82(1921).—A 2% starch paste was subjected to electrodialysis; it then was heated to 120° for 30 min. when it sepd. into 2 layers, the upper layer which consisted of an amylose soln. was removed, water was added to the lower layer which was again subjected to electrodialysis. This treatment was repeated 7 or 8 times until the clear top liquid was not colored by iodine. A transparent jelly remained containing 5 to 8% amylopectin which was colored violet-brown by iodine. This jelly contained 0.162% P₂O₅, indicating a phosphoric ester of some carbohydrate. When dild. to a 2% soln. this jelly had an elec. cond. of 53.1^{-4} and a mean mol. wt. estd. from its osmotic pressure of 140,000. The top or amylose soln. was colored blue by iodine, its mol. wt. was 60,000 to 70,000, $\alpha_D = 189^\circ$, and elec. cond. varied between 3 and 5.1^{-4} . The amylopectin heated with water to 120° was progressively hydrolyzed into H₂PO₄ and a sol. carbohydrate which was not further separable by electrodialysis. If heated in a Pt dish the soln. became acid, the carbohydrate set free disintegrated and after 8 hrs. of heating at 120° its mol. wt. averaged 2000, $\alpha_D = 196^\circ$, elec. cond. 67.1^{-4} .

gave a violet-brown color with iodine, and was able in part to traverse collodion membranes. If heated in Ni dishes instead of Pt, the acid product was neutralized, the amylopectin was saponified without disintegration, and the mol. wt. nearly doubled on heating for 6 hrs. at 120°. A similar result was obtained by heating the amylose soln. The carbohydrate derived from amylopectin formed a limpid soln. whose viscosity and elec. cond. were of the same order as distd. water, and whose reducing power was only 0.506 g. Cu for 1000 g. of the dissolved substance. The carbohydrate from amylopectin requires about twice the $\text{Ba}(\text{OH})_2$ or 3 times the tannin for its pptn. as amylose of equal concn. The varying colors with iodine are attributed to the varying proportions of lactic and hydroxyl chains in the mol.

L. W. RIGGS

Action of emulsin on galactose in solutions in propyl alcohol of different concentrations. MARC BRIDEL. *Compt. rend.* 172, 1130-2(1921); cf. Bourquelot, *et al.*, *C. A.* 7, 1486, 1884, 2759.—Nine mixts. were prepd. contg. 0.4848 g. of galactose and 10, 15, 25, 35, 45, 55, 65, 70, and 75 g. of pure propyl alc., resp., and each made up to 100 cc. with water. Each mixt. received 1 g. of emulsin, was placed in a thermostat at 30° and all were tested for free galactose after 14, 21, 29, 46, and 113 days. The β -galactosidase enzyme contained an almond emulsin, which acts upon the β -galactosides, is rapidly destroyed at 30° in solns. containing 10, 15, 25, 35, and 45 g. of PrOH, resp., per 100 cc., but not in greater concns. It retains its activity at ordinary temp. in each of the concns. of PrOH of the expt. β -Galactosidase unites galactose to PrOH whatever may be the concn. of the alc. present. The proportion of combined galactose increases at first with the concn. of the alc., then, on account of the destruction of the enzyme, this proportion diminishes in concns. of 45 and 55 g. of alc. per 100 cc. In concns. of 65, 70, and 75 g. of PrOH per 100 cc., the enzyme is more active and the proportion of galactose uniting with the PrOH increases, reaching 80% with the PrOH at 75 g. per 100 cc.

L. W. RIGGS

UEXKULL, F. v.: *Theoretische Biologie*. Berlin: Gebr. Paetel. 200 pp., 20 M., geb. M 27. For review see *Z. physik chem. Unterricht* 43, 142(1921).

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

The simplification of colorimetric methods by the use of standards prepared from dyes. MAKI TAKATA. Univ. Sendai. *Tohoku J. Exp. Med.* 1, 460-74(1920).—T. uses the following standards:

	A. cc.	B. cc.	C. cc.	D. cc.
Water blue (Grubler) 0.01%	20	3	3.5	1
HCl, sp. gr. 1.050	20	10	10	10
$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, 10 g. per 100 cc.	12	5	5	4
Nigrosine (Grubler) 0.001%	10	10	0	0
Water, distd. q. s.	100	100	100	100

Standard A set at 10.5 mm. in a Dubosc colorimeter matches the urine uric acid standard of Bogert (cf. *C. A.* 11, 2477) at 10 mm. and B at 24.5 mm. matches Folin and Wu's standard (cf. *C. A.* 13, 2545) at 20 mm. Standard C for uric acid in blood exactly matches Folin and Wu's 0.1 mg. standard (cf. *C. A.* 13, 2541), and D the 0.2 mg. in 50 cc. standard. These same colors may be used for the detn. of adrenaline by the method of Folin, Cannon and Denis (cf. *C. A.* 7, 2047). A 0.5 N soln. of K_2CrO_4 at 8 mm. matches the acetone standard of Csonka (cf. *C. A.* 10, 3079) at 10 mm. For cholesterol T. uses $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (20 g. per 100 cc.) 10 cc. and NaCl (30 g. per 100 concn.) 22 cc. This exactly matches Bloor's standard (cf. *C. A.* 10, 1656) of 0.5 mg. in 5 cc. of CHCl_3 soln. The

following soln. is used for *amino acids*: Water blue (0.2 g. per l.) 10 cc., safranine (0.01 g. per l.) 30 cc., HCl (1.0%) 10 cc., H₂O (q. s.) 200 cc. This corresponds to the alanine standard of Harding and MacLean (cf. C. A. 9, 1340; 10, 2749) as 15, 20, 24 to 14, 18, 32.4 mm., resp. For *glucose in blood*, according to Folin and Wu (cf. C. A. 13, 2541), T. uses Water blue (bleu a' l'eau) (0.01 g. per l.) 50 cc., nigrosine (0.02 g. per l.) 12 cc., CuSO₄·5H₂O (10 g. per 100 cc.) 10 cc., HCl (1%) 2 cc., H₂O (q. s.) 100 cc. 14.5 m. of this matches 15 mm. of the standard of Folin and Wu.

H. V. ATKINSON

The normal presence of bromine in animal tissues. II. A. DAMIENS. *Bull. sci. pharmacol.* 28, 37-48(1921); cf. C. A. 15, 2105.—D. studied the conditions affecting the method of Denigés and Chelle (C. A. 7, 746) for the detection of Br in solns. from various sources. The final modification and procedure was to add successively to 10 cc. of the soln. to be tested, 0.4 cc. HCl and 2 cc. H₂SO₄, cool, add 0.4 cc. 10% K₂CrO₄, let stand 10 mins., add 2 cc. sulfuric fuchsin soln., and 2 cc. CHCl₃. The mixt. is shaken vigorously for 30 seconds and allowed to stand, when the CHCl₃ becomes violet tinted if Br is present. The reaction is quantitatively sensitive when from 0.1 to 0.005 mg. Br is present; e. g. from 0.005 to 0.05 mg. the accuracy is 0.005 mg.; from 0.06 to 0.10 mg. the accuracy is 0.01 mg. Above 0.10 mg. the shades of coloration are difficult to distinguish from each other or to compare with standards. It was found that the presence of alkali iodides or iodates in amts. up to 50 mg. does not interfere with the detn. of the Br after the digestion. When HNO₃ or free Cl are present plus errors are obtained. The method of prepn. of the sample for testing is given in such detail that its scope exceeds that of an abstract.

F. S. HAMMETT

The nephelometric estimation of quinine in blood. H. W. ACTON and HAROLD KING. *Biochem. J.* 15, 53-59(1921).—A modification of the method used by Ramsden and Lipkin (cf. C. A. 12, 2205) wherein the turbidity is developed by the addition of potassium mercuric iodide. The authors admit that the method is not very practical since "a single complete estn. takes 3-4 hrs." and "scrupulous care is required to be exercised over this period involving a considerable strain on the operator."

BENJAMIN HARROW

Determination of morphine in the urine. HIROSHI ŌSHIKA. *Acta Schol. Med. Univ. Imp. Kioto* 3, 351-62(1920).—The method of Kaufmann-Asser (cf. C. A. 8, 182) for the detn. of morphine in the urine is not quant. When the CHCl₃ ext., obtained from the urine and containing the morphine, is heated, HCl is formed; it combines with the morphine, and ppts. that alkaloid. When the titration is made with standard KOH, the amt. of morphine found is low by the amt. thus pptd. as its hydrochloride. HCl is not formed in the CHCl₃ exts. obtained from the liver, the stomach, or the feces; nor is it formed in the CHCl₃ ext. obtained from the urine in the absence of morphine.

JOSEPH S. HEPBURN

Detection of biliary pigments in blood serum. ANON. *J. Méd. Bordeaux*. Jan. 10, 1920; *Schweiz. Apoth. Ztg.* 59, 14(1921).—Two rapid methods are given. (1) Method of Fouchet. Mix in a porcelain dish 5 drops of clear blood serum with an equal vol. of a soln. containing 5 g. trichloroacetic acid, 2 cc. FeCl₃, and 20 cc. distd. H₂O. A green color, at its max. in 20 min., is observed; it is instantaneous if there is more than 1 part bilirubin in 20,000. With 10 cc. serum, 1 part bilirubin in 60,000 may be detected. (2) Auché method (modified by Denigés). Soln. A. To 1 g. ZnSO₄ dissolved in 10 cc. distd. H₂O, add just sufficient NH₄OH, drop by drop, to dissolve the ppt. first formed, and bring to 50 cc. by the addition of 15% KCN soln. Soln. B. Iodine, 1 g., KI, 2 g., distd. H₂O, 100 cc. METHOD. To 5 cc. EtOH (90-95%) in a test-tube add 5 drops serum (more if necessary), shake, add 20 drops NH₄OH; filter through a pleated filter. Examine with a direct vision pocket spectroscope through the largest aperture; biliary pigments exhibit an absorption band in the red. In the presence of urobilin, there will be a second band between the yellow and green and the liquid will show a sharp green fluorescence.

F. F. HEYROTH

Determination of the amino acids of the urine. Method of Sørensen simplified by Mestrézat. L. G. *J. pharm. chim.* [7] 23, 137-141 (1921); cf. *C. A.* 14, 2006.—M. found the Rouchès method inaccurate, because the methylene compd. into which the amino acids are transformed by formol acts as a weak acid titratable by 0.5 *N* or 0.1 *N* NaOH only by bringing the phenolphthalein to a full red. This Sørensen attempted to do in a long, complicated method which M. simplifies. Mix 10 cc. com. 35-40% formol, undiluted with H₂O, but neutralized, with 20 or 30 cc. of boiled distd. H₂O to make the total vol. about that of the sample; add 10 drops of 1% alc. soln. of phenolphthalein, and finally, 0.3-0.4 cc. of 0.1 *N* NaOH to obtain a full red. In a 100 cc. flask shake 50 cc. urine, 2 g. powdered BaCl₂, and 2 drops of alc. phenolphthalein. When the BaCl₂ has dissolved, add an excess of satd. baryta water (5 cc. more than is required to change the color of the phenolphthalein), stopper and let stand 15 min. Filter and take for the titration 20 cc. of the filtrate, corresponding to 10 cc. urine. Add 10 drops of alc. phenolphthalein soln. and, drop by drop, dil. HCl until decolorized, then 0.1 *N* NaOH to the appearance of a pale rose tint. Then add, at one time, 10 cc. 35-40% formol, neutralized but not diluted, to cause decolorization. Titrate with 0.1 *N* NaOH; after the color is a persistent rose add the NaOH 2 drops at a time to exactly the same red as that of the standard sample prepd. as above. The number of cc. required, diminished by the 0.3-0.4 cc. used in the standard sample, gives the vol. NaOH used for the neutralization of the acid functions of the amino acids liberated by the formol. Eliminate the retardation due to the presence of NH₄ salts by adding the 0.01 part of the buret reading, and multiply by 0.0014 to express the wt. of amino-ammoniacal N in 10 cc. urine. To det. amino-N, subtract the ammonia-N detd. on another portion of the sample by the method of Schloesing. F. F. HEYROTH

Examination of a pentose-containing urine. ED. JUSTIN-MUELLER. *J. pharm. chim.* [7] 23, 317-321 (1921).—Doubtful results found in the application of the color tests for pentoses to a sample of urine led J.-M. to study the reactions of arabinose in the presence of various urines. Color reactions of HCl with either phloroglucin or orcin are easily influenced by skatol or indoxyl pigments, and are valueless in urines containing large amts. of these pigments. The "violet-blue" color stated by Bial and others to be produced in a positive orcin test for pentose is seen only in the presence of large amts. of skatol; in skatol-free urine the color of the ring is rose, changing quickly to green.

F. F. HEYROTH

Vitamines and yeast growth. ROGER J. WILLIAMS. Univ. Oregon. *J. Biol. Chem.* 46, 113-8 (1921).—A comparison has been made of the vitamine content of different foodstuffs, as detd. by the yeast method (*C. A.* 14, 2350), with their vitamine content as detd. by Osborne and Mendel (*C. A.* 14, 2364) by the use of growing rats. "The quant. yeast method for detg. vitamine in the materials selected by Osborne and Mendel gives results fairly concordant with the results obtained by Osborne and Mendel in rat feeding expts. Bakers' yeast, however, by the yeast method shows a much higher vitamine content than brewers' yeast, whereas by animal feeding expts. brewers' yeast is found much richer. A bakers' yeast ext. is found to be richer as regards the growth of bakers' yeast than a brewers' yeast ext. A brewers' yeast ext., however, is richer in affecting the growth of brewers' yeast than a bakers' yeast ext. This is interpreted to mean that there is some specificity in growth stimulants, but not necessarily two totally different substances stimulating the growth of the two varieties of yeast." Some evidence was obtained of the possibility that vitamine C, as a secondary factor, may stimulate yeast growth.

A. P. LOTHROP

A hydrogen electrode vessel adapted for titrations. A. BAIRD HASTINGS. College of Physicians and Surgeons, Columbia Univ. *J. Biol. Chem.* 46, 463-6 (1921).—The vessel is constructed in such a way that gases or volatile matter cannot escape and permits the use of small samples of material in making electrometric titrations. The

electrode vessel, the only part requiring the service of a glass-blower, consists of an upper stationary portion, *A*, consisting of a glass tube which carries by means of a rubber stopper the electrode, buret, and gas inlet and outlet tubes; and a lower rotating portion, *B*, which contains the substance under examn. A Hg seal makes possible a gas-tight chamber. A cross section of *A* is given in Fig. 2. The glass tube *a* is permanently fixed in *A*. At its lower extremity, a short detachable electrode, *b*, is attached to it by means of rubber tubing, *c*. The short electrode *b* consists of a small Pt wire, one

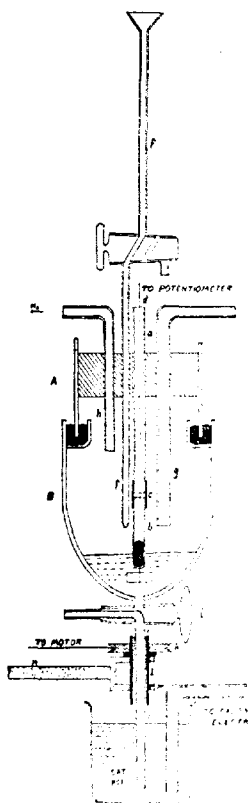


Fig. 1

stopcock and remove the pipet. Begin the rotation and continue until equil. is reached. Leave a central band of the stopcock *i* ungreased in order to effect contact between the H and calomel electrodes. Take the readings and make the titrations according to the usual technic. "Potential measurements made through a closed stopcock cannot be made with as great accuracy as those made through an open system. We have found that H-ion detns. of standard solns. made simultaneously with the Clark electrode and our app. agreed within one millivolt. Since this error lies within the limits in which

end of which is fused into the glass tube and to the other end of which has been fused a bit of Au or Pt beaten out in the form of a paddle by means of which stirring is effected. It can easily be removed for recoating with Pd or Pt. The Cu wire *d* extending the length of tube, *a*, and dipping into the Hg contained in *b*, affords connection with the potentiometer. To *f*, a 1 cc. Mohr pipet, graduated in 1/100th of a cc., is sealed a small funnel at the upper end and a 3-way stopcock at the lower end. Connection with a piece of capillary tubing which extends through *A* is made by means of rubber tubing or by sealing the ends together. The remaining parts carried by *A*, namely the inlet tube *g* and the outlet tube *h* require no explanation save that a trap should be provided at the outlet to prevent the backflow of air. Part *B*, the lower rotating portion of the electrode vessel, carries a stopcock, *i*, with a right-angled bore which can alternately connect the vessel or the long glass stem *j* with the exterior. Rotation of *B* can be effected in any convenient manner but in Fig. 1.

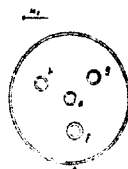


Fig. 2

the stem *j* is held in a wooden pulley, *k*, by means of a rubber stopper. Within and attached to the pulley is a brass tube, *l*. This rotates within the brass sleeve, *m*, whose side arm, *n*, is clamped to a ring stand. *Manipulation of the electrode.*—Fill the vessel with H. Admit the soln. to be investigated to *B* by a pipet attached to stopcock, *i*, by means of a short piece of rubber tubing. This can be washed out and renewed as often as necessary. Turn the stopcock *i* so that the stem *j* is connected with the exterior and draw up and out of the stopcock the satd. KCl soln. into which *j* dips, by means of the pipet which is still attached. Turn off the

H-ion detns. of biological materials can be reproduced, we believe that for the present purposes, at least, it does not detract significantly from the accuracy of the results obtained."

A. P. LOTHROP

A simple method for the direct quantitative determination of sodium in small amounts of serum. BENJAMIN KRAMER AND FREDERICK F. TISDALL. Johns Hopkins Univ. *J. Biol. Chem.* 46, 467-73(1921).—The method is a modification of the one recently described by Kramer (*C. A.* 14, 951); the Na is pptd. directly from the serum thus doing away with the ashing process. The method is accurate to within $\pm 2.5\%$.

Method.—Transfer 2 cc. of serum (which may be sepd. from the clot any time within 24 hrs. after collection of the sample) into a scrupulously clean Pt dish (cleaned with fine sand and rinsed with distd. H_2O) and add 10 cc. of $K_2H_2Sb_2O_7$ reagent and then 3 cc. of redistd. alc., drop by drop, while stirring with a rubber-tipped rod. Allow to stand 45 min. Transfer to a weighed Gooch crucible (prepd. as described below), using moderate suction after the pad has become soaked so that the fluid goes through at a rate of 10-15 drops per min. When all the fluid has passed through, transfer the small amt. of ppt. remaining in the Pt dish to the Gooch crucible by means of 8-12 cc. of 30% alc. Place the crucible in a drying oven and gradually raise the temp. to 110° . Dry at 110° for 1 hr., cool in a dessicator for 30 min. and weigh. Wt. of ppt./11.08 = mg. of Na in the sample. **Reagent.**—Heat 500 cc. of distd. H_2O to boiling in a Pyrex flask and add approx. 10 g. of J. T. Baker $K_2H_2Sb_2O_7$. Boil for 3-5 min., cool the flask immediately under running H_2O and when cold add 15 cc. of 10% KOH (alc.-washed) (this soln. must be kept in a paraffined bottle). Filter through an ash-free paper into a paraffined bottle. Allow to stand for 24 hrs. Use the clear supernatant liquid so long as it remains clear; the reagent keeps well at room temp. for at least 1 month. Before being used for the first time, it should be tested for the presence of Na and no $K_2H_2Sb_2O_7$ should ppt. when alc. is added in the proportion in the method; to 10 cc. of the reagent in a Pt dish add 2 cc. of distd. H_2O and 3 cc. of 95% alc. **Prepn. of Gooch crucible.**—Place one layer of No. 40 Whatman filter paper in the bottom of the crucible, on top of this a thin layer of asbestos, then a second piece of filter paper and finally a second layer of asbestos. The pores of the filter must be plugged by filtering through it 300-400 mg. of $Na_2H_2Sb_2O_7$. Prepare it by adding 10 cc. of the reagent and 3 cc. of alc. to 2 cc. of a NaCl soln. containing 3-5 mg. of Na per cc. 60-100 mg. of ppt. are obtained after standing 5 min. Transfer the ppt. to the crucible and wash with 30% alc. Repeat until 300-400 mg. of ppt. have been transferred. After a crucible has been used for 25 detns., only moderate suction is necessary to produce the optimum rate of filtration. If 4 crucibles are prepd. in the manner described, over 100 detns. may be made before it is necessary to prep. a new set.

A. P. LOTHROP

The duodenal segment of the albino rat as a standard reagent for the study of tissue extracts and other substances. F. S. HAMMETT. Wistar Inst. *Am. J. Physiol.* 55, 404-13(1921).—App. and methods are described by which the isolated duodenal segment of the albino rat can be so prepd. and standardized as to be available for quant. use as a test-organ in a wide range of biochem., physiol. and pharmacol. investigations.

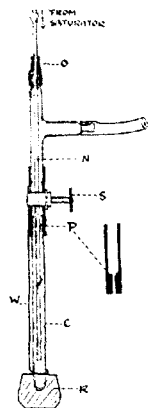
J. F. LYMAN

A probable error in determinations by means of the hydrogen electrode. C. L. EVANS. Nat. Inst. Med. Research, London. *J. Physiol.* 54, 353-66(1921).—Electrometric detns. of the reaction of blood or bicarbonate solns. yield results which represent H^+ concns. about 60% higher (p_H 0.2 lower) than those given by the colorimetric method of Dale and Evans. The calcd. reaction of a bicarbonate- CO_2 soln. agrees with that detd. colorimetrically, if values for the apparent dissociation const. of H_2CO_3 (K) and for the degree of ionization of the bicarbonate (S) as detd. by the cond. method are employed. When const. (K) or (S) derived from the H-electrode measurements are used in calcg. the reaction of a bicarbonate soln. the results naturally agree with those

of direct observation by means of the H electrode. Such calcd. results do not agree with colorimetric measurements. It is inferred that the H-electrode detns. and not the colorimetric ones are erroneous. A source of error in the H electrode is indicated in that formic acid is produced by catalysis when the soln. in the H electrode contains carbonates.

J. F. LYMAN

An apparatus for centrifuging blood without change of its gas content. T. R. PARSONS. *Proc. Physiol. Soc., J. Physiol.* **54**, iv(1920).—The centrifuge tube itself is a simple glass tube (C) about 7.5 cm. long with a capacity of 1 cc. At its open end



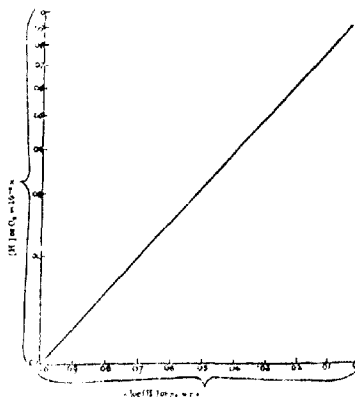
it is provided with a short length of thick-walled capillary bore rubber pressure-tubing (P), and a specially small screw-clip (S). In making the latter the brass nuts and screws commonly sold for model making were found very useful. The tube is protected while in the centrifuge by a thick pad of rubber (R), cut from a stopper, a stiff iron wire (W) is included in the clip and extends down until it ends in a loop against (R). The rubber tube (P) is of capillary bore only for the length which is actually gripping the centrifuge tube; the remainder is reamed out in the manner represented in the section alongside the main drawing. The central tube (N) is connected at its upper end to the app. used for bringing the blood into equil. with the gas mixture. During the satn. the gas passes down this central tube and up and out through the side side piece of the T-tube. When the blood is made to follow, the central tube is slowly drawn up through the thick-walled tubing at (O), so that by the time the centrifuge tube (C) is completely filled the central tube is clear of the clip (S). The centrifuge tube is then clipped off and removed from the T-piece, and any blood remaining in the rubber tube above the level of the clip is removed.

When the centrifuging is completed the plasma is withdrawn by means of a pipet drawn out into a capillary which passes loosely through the rubber tubing (P).

J. F. LYMAN

A graphic conversion of Sorensen's p_{H} ($-\log \text{H}^+$) into concentrations of hydrogen ions. H. E. ROAF. *Proc. Physiol. Soc., J. Physiol.* **54**, xvii(1920).—A simple method for converting $-\log \text{H}^+$ into true concns. is to draw a diagonal line on semi-log paper. The first decimal points of the $-\log \text{H}^+$ expression are plotted from right to left as abscissas and the concns. from 0.1 to 1 against the logarithmic rulings as ordinates. The whole no. of the $-\log \text{H}^+$ gives the negative power of 10 by which the concn. must be multiplied. For example to convert $p_{\text{H}} = 6.7$ into C_{H} , 0.7 cuts the diagonal line opposite 0.2; therefore the $C_{\text{H}} = 0.2 \times 10^{-6}$.

J. F. LYMAN



The colorimetric determination of the reaction of blood by dialysis. H. H. DALLS AND C. L. EVANS. *J. Physiol.* **54**, 167-77(1920).—App. is described which is designed to eliminate the error in the method of Levy, Rowntree and Marriott due to loss of CO_2 from blood or serum placed in the dialyser. With slight modification the app.

might be used for detg. the reaction of arterial blood of the anesthetized animal during actual circulation.

J. F. LYMAN

Economical dehydrating and clearing agents. H. HARTIDGE. *Proc. Physiol. Soc., J. Physiol.* 54, viii(1920).—Amyl alc. can be substituted for abs. alc. and clove oil in the prepn. of microscopic sections. No. 1 petrol was substituted for xylene.

J. F. LYMAN

An improved form of Barfoed's reagent. H. E. ROAF. *Proc. Physiol. Soc., J. Physiol.* 54, lx(1921).—The reagent is made by adding AcONa to $(\text{AcO})_2\text{Ca}$ in AcOH . In this way ionization of the AcOH is decreased and the reagent is reduced by glucose on merely bringing the mixt. to boiling. By decreasing the acidity hydrolysis of disaccharides is decreased but the reagent will show reduction with less of the hydrolyzed product so prolonged boiling should be avoided. If the acidity is too far reduced heating will cause hydrolysis of the weak salt, thus CuO will be pptd. The proportions recommended are $(\text{AcO})_2\text{Cu} \cdot \text{H}_2\text{O}$ 50 g., AcONa 50 g., glacial AcOH 5 cc., H_2O to 1000 cc.

J. F. LYMAN

A method for the determination of calcium, magnesium, potassium, sodium, chlorides and "acid-soluble" sulfur and phosphorus in one sample (25 cc.) of blood. I. GREENWALD AND J. GROSS. Roosevelt Hosp., New York. *Proc. Soc. Exptl. Biol. Med.* 17, 50-1(1919).—The blood is laked with 8 vols. of H_2O and the protein pptd. by addition of 1 vol. of 1:1 HNO_3 . In a portion of filtrate Cl is detd. by pptn. with AgNO_3 and filtering on a Gooch crucible. The excess of Ag in the filtrate is removed with HCl and the resultant filtrate and the remainder of the blood filtrate are combined and treated with $\text{Cu}(\text{NO}_3)_2$ and HClO_4 , evapd. to dryness and then to blackness. The residue is treated with concd. HCl , again evapd. to dryness and then dissolved in dil. HCl . Sulfates are pptd. with BaCl_2 and the filtrate is made ammoniacal, then acid with CH_3COOH and phosphates are pptd. with FeCl_3 . The ppt. is dissolved in HNO_3 and the H_3PO_4 is pptd. with $(\text{NH}_4)_2\text{MoO}_4$ and the yellow ppt. is titrated. The filtrate from the $\text{Fe}(\text{CH}_3\text{COO})_3$ ppt. is treated with H_2SO_4 to remove the Ba and with H_2S to remove the Cu and the filtrate is evapd. to a small vol. Ca is pptd. in a centrifuge tube as oxalate, washed and titrated. The supernatant liquid and washings are evapd., heated to remove ammonium salts and the Mg is pptd. in a centrifuge tube as $\text{MgNH}_4\text{AsO}_4$. This is washed and then dried, *in vacuo*, over H_2SO_4 . It is dissolved in acid, transferred to a distn. flask and the NH_3 is detd. by distn. and Nesslerization. The supernatant liquid and washings are treated with HCl and HBr , evapd. to dryness, freed of ammonium salts and As, H_2SO_4 is added and the K and Na are weighed as mixed sulfates in a Pt dish. K is then pptd. as the cobaltinitrite and weighed.

V. C. MYERS

A method for the estimation of lactic acid in blood. G. A. HARROP, JR. Johns Hopkins Hosp. *Proc. Soc. Exptl. Biol. Med.* 17, 126-3(1920).—This is based on the observation by Denigès that lactic acid is converted by conc. H_2SO_4 to AcH and can be detd. by phenols and morphine alkaloids. Five cc. of blood or serum is measured into 15 cc. of acidified CuSO_4 soln. It is heated 4-5 min. on the H_2O bath, cooled, and an excess of powdered $\text{Ca}(\text{OH})_2$ is added. After 30 min. it is filtered, and 1 part filtrate is added to 4 parts concd. H_2SO_4 while the mixt. is shaken and cooled in a dish of ice H_2O . It is then placed in a boiling H_2O bath for 2 min., then cooled in ice H_2O , after which 3 drops of 5% soln. of guaiacol are added, and the mixt. is allowed to stand for 20 min. The rose color is read against standards prepd. with known amts. of lactic acid (from Zn or Li lactate).

V. C. MYERS

The determination of small quantities of sugar in urine, including observations on the polysaccharide content of human urine. S. R. BENEDICT. Cornell Univ. Med. Col. *Proc. Soc. Exptl. Biol. Med.* 17, 183(1920).—A procedure has been developed for detg. sugar in the presence of 3 or 4 times its wt. of creatine or creatinine; when applied to urine this reaction gives figures which duplicate very closely those found

with the $\text{Hg}(\text{NO}_3)_2$ method (C. A. 12, 1304). After mild hydrolysis with HCl normal urines show increase in reducing substance of about 0.5 g. per day. Much higher figures are obtained in cases of diabetes mellitus.

V. C. MYERS

An artificial cell. R. KOLKOWITZ. *Ber. botan. Ges.* 38, 136-40(1920).—One end of the app. is a glass of about 100 cc. capacity, shaped like a thistle tube. This is connected by a stopcock with a cylindrical piece of about 5 cc. capacity. The stopcock is bored to connect the two, or to connect either with the air. Some expts. illustrating the osmotic properties of living cells are described.

T. G. PHILLIPS

Discrepancies in blood oxygen analyses by the methods of Van Slyke and Henderson-Smith. A. H. SMITH, J. A. DAWSON AND B. COHEN. *Yale Univ. Proc. Soc. Exptl. Biol. Med.* 17, 211-3(1920).—Analyses by the Van Slyke method yield 4 to 10 vols. % more O than those by the Henderson-Smith method. The higher values obtained by the former method are in part due to the fact that the gas analyzed is not all O, but contains N, and probably CO, H, CH_4 and the rare atmospheric gases. In the latter method the values should be raised by a small correction for H_2O vapor pressure, and for the physically held O in the fluid due to increased partial pressure. The results after corrections are made are much closer together, though not identical.

V. C. MYERS

The determination of carbohydrates in vegetable foods (MYERS, CROLL) 12. The inversion and determination of cane sugar (ROSE) 7. The use of edestin in determining the proteolytic activity of pepsin (BREWSTER) 17. Report to A. O. A. C. on inorganic plant constituents (MITCHELL) 7.

KLOPSTOCK M. and KOWARSKY, A.: *Praktikum der klinischen, chemischen, mikroskopischen und bakteriologischen Untersuchungsmethoden*. WEIN: Urban & Schwarzenberg, 518 pp. M 36. For review see *Deut. Med. Wochschr.* 47, 660(1921).

MEYER, ARTHUR: *Morphologische und Physiologische Analyse der Zelle der Pflanzen und Tiere*. Gena: Gustav Fischer. 629 pp. M 38.

C—BACTERIOLOGY

A. K. BALLS

Studies on the cycloclastic power of bacteria. II. A quantitative study of the aerobic decomposition of tryptophan and tyrosine by bacteria. HAROLD RAISTRICK AND A. B. CLARK. *Biochem. Lab., Cambridge. Biochem. J.* 15, 76-82(1921); cf. C. A. 14, 1351.—Both in the presence and absence of glycerol, *B. pyocyaneus*, *B. fluorescens* and *B. prodigiosus* can attack and produce ammonia from both the side chain and the indole nucleus of the tryptophan molecule. *B. prodigiosus* produces NH_3 from the side chain much more quickly than from the nucleus. *B. proteus vulgaris* attacks the side chain only. In the absence of glycerol much free NH_3 and small amts. of N are produced; in the presence of glycerol the reverse is true. This offers an explanation of the "protein-sparing action" of carbohydrate; bacteria need for their anabolic processes certain relative amts. of N and C. If the available N is in excess of that amt. necessary to combine with the available C for these synthetic purposes, this N appears as NH_3 ; if the amt. of available C is in excess of the amt. necessary to combine with the available N for synthesis, no NH_3 is formed because all the N is used for synthesis. "We believe that carbohydrates far from having a 'protein-sparing' effect in the sense used by the authors, actually enable bacteria to utilize more protein or protein products than they would in the absence of carbohydrates." With tyrosine as with tryptophan, relatively large amts. of NH_3 but very little N is formed in the absence of glycerol; the reverse again is true in the presence of glycerol. Both in the presence and absence of glycerol, there is an almost complete disappearance from the tyrosine of phenolic groups giving a color reaction with Folin's reagent. This suggests either that (a) the benzene ring has been ruptured giving rise to straight-chain compds.,

or (b) that the OH group has been removed from the nucleus. The evidence points to the second of the two alternatives.

BENJAMIN HARROW

Utilization of different chemical compounds as nitrogenous food by several pathogenic bacteria. BRUNO KISCH. Univ. Prag. *Centr. Bakt. Parasitenk., Abt. I. Orig.* 82, 28-47(1918).—The different bacterial species of the colon-typhoid group show typical differences in their ability to utilize different nitrogenous compds. as nutriment. *Bacillus paratyphi A* is a peptone bacillus but has amino-positive strains. *B. typhi* is an amino bacillus with ammonia-positive and nitrate-positive strains; *B. typhi murium* is an ammonia bacillus; *B. enteritidis* Gärtner, *B. coli*, and *B. paratyphi B* are nitrate bacteria. *Vibrio cholerae* and the bacillus of chicken cholera are amino bacteria with ammonia-positive strains. The Flexner and Y strains of *B. dysenteriae* are ammonia bacteria with nitrate-positive strains, while the Shiga-Kruse strain is an amino bacillus with ammonia-positive strains. A medium containing $(\text{NH}_4)_2\text{SO}_4$, $\text{NH}_4\text{H}_2\text{PO}_4$, NH_4 lactate, of NH_4 tartrate, 1% glucose, and nutrient salts serves to differentiate the *A* and *B* varieties of *B. paratyphi* from each other. Thus, on agar plates of this medium, *B. typhi* developed as scanty, isolated colonies within 24 to 48 hrs., *B. paratyphi A* showed absolutely no colonies at the end of 72 hrs., and *B. paratyphi B* formed a dense, luxuriant growth at the end of 24 hrs. The nutrient value, with respect to N, of NH_4 compds. increased in the following order: NH_4Cl , $(\text{NH}_4)_2\text{CO}_3$, $(\text{NH}_4)_2\text{SO}_4$, $\text{NH}_4\text{H}_2\text{PO}_4$, NH_4 lactate, NH_4 tartrate. The bacteria studied utilized the N as does the mold *Aspergillus niger*. If *B. typhi* (*typhosus*), growing on a medium containing nitrate or NH_4 ions, were further cultivated, it yielded strains which possessed all the characteristics of that bacterial species, but also grew very luxuriantly on glucose agar containing nitrates or NH_4 salts.

JOSEPH S. HEPBURN

Chemosynthesis and denitrification with sulfur as the source of energy. M. W. BEIJERINCK. *Prop. Acad. Sci. Amsterdam* 22, 899-908(1920).—Some of the denitrifying bacteria (*B. denitrificans*, *B. stutzeri*, and probably other species) may occur as 2 physiologically different modifications, autotrophic and heterotrophic, each of which remains hereditarily const. so long as the medium remains unchanged. The autotrophic form is adapted to an inorg. medium containing a nitrate, CaCO_3 , and either S or a thiosulfate; N_2 and CO_2 are evolved and sulfates are formed. The heterotrophic form requires org. food, and preserves the power of denitrification on such a medium. Intermediate forms also exist which feebly denitrify in an inorg. medium; hence the autotrophy may gradually be lost. Since great changes in the nature of the food may produce hereditary modifications of certain factors, the causes which give rise to ontogeny become somewhat clearer.

JOSEPH S. HEPBURN

The nutritional requirements of yeast. III. The synthesis of water-soluble B by yeast. V. E. NELSON, ELLIS I. FULMER, AND RUTH CRESSNA. Iowa State College. *J. Biol. Chem.* 46, 77-81(1921); cf. *C. A.* 15, 694.—Water-sol. B is not an essential constituent of the medium for the growth of yeast but yeast is capable of synthesizing that vitamin. "The medium used for the growth of the yeast had the following compn.: 0.188 g. of NH_4Cl , 0.1 g. of CaCl_2 , 0.1 g. of K_2HPO_4 , 0.04 g. of CaCO_3 and 10 g. of sucrose per 100 cc. of distd. H_2O . The yeast was plated from a Fleischmann yeast cake. The yeast had been growing continuously in the above medium for a year. It was grown in 50 cc. portions of the medium, 1 cc. of the culture being transferred every other day to 50 cc. of fresh medium thus geometrically dilg. out any of the original constituents of the medium or of the yeast. The max. concn. possible for the original constituents of the medium or yeast would be 1×50^{-100} . It can be concluded that after such an experience any H_2O -sol. B present in the yeast must be synthesized by the organism." Sufficient yeast was grown for feeding expts. on rats which made rapid gains when 2% of the yeast grown on the synthetic medium was added to the ration which was H_2O -sol. B-free and on which the rats had begun to decline rapidly.

A. P. LOTHROP

The "bios" of Wildiers and the cultivation of yeast. M. IDE. Univ. Louvain, Belgium. *J. Biol. Chem.* **46**, 521-3(1921).—The conclusion of MacDonald and McCollum (*C. A.* **15**, 1150) that "either yeast must grow without 'bios,' or it must synthesize the substance to meet its own needs" may be correct but it also may be misleading as a distinction should be made between two kinds of proliferation of yeast, one very slow without "bios" and one fast with "bios." For rapid growth in which proliferation is increased 30 times a special "biosine," sp. in its influence on the growth of yeast, is necessary; and "none of the known org. substances described up to the present time has any comparable influence on yeast. For rapid growth, the yeast needs a large portion of its nitrogenous food in the form of biosine. Small quantities of impurities is an incorrect expression for the biosine food. As yet, no difference has been observed in the chem. properties of the H_2O -sol. B of Myers and Voegtlin and biosine." But it cannot be stated yet with absolute certainty that H_2O -sol. B vitamin and "bios" are the same substance.

A. P. LOTHROP

The "bios" of Wildiers and the cultivation of yeast. MARGARET B. MACDONALD AND E. V. MCCOLLUM. Johns Hopkins Univ. *J. Biol. Chem.* **46**, 525-7(1921); cf. preceding abst.—Some factor other than the antineuritic vitamin has a stimulating effect on the growth of yeast, as exts. of food materials heated with alkali sufficiently long to destroy all the antineuritic substance have been shown to exert a stimulating effect in a manner entirely comparable with exts. prepd. from the same untreated food materials. "We are fully in accord with Ide in his statement that there is a most striking difference in the rate of proliferation of yeast in purified nutrient soln., as contrasted with the same after the addition of exts. of natural foods. The explanation for this may possibly be considered of twofold character." The added exts. may be potent because of improvement in the nutrient substances. The raising of the viscosity of the soln. by the added exts. may be of equal importance, as it has been recently shown by Fulmer, Nelson, and Sherwood (*C. A.* **15**, 694) that addition of colloidal substances, such as highly purified starch or dextrin, to the purified nutrient soln. exerts a markedly favorable influence on the growth of yeast. "This affords convincing evidence that the optimum nutrient conditions for the development of yeast in media containing only known substances have not been appreciated or achieved by any foreign investigator up to the present time. The experience of Fulmer, Nelson, and Sherwood, correlates so perfectly and supplements so satisfactorily our own studies that we feel safe in asserting that it is fully established that neither the hypothetical 'bios' nor the antineuritic or other uncharacterized dietary factor essential in the nutrition of mammals need be supplied in order to enable yeast to develop."

A. P. LOTHROP

Variations in the resistance of protozoön organisms to toxic agents. R. A. PETERS. Cambridge. *J. Physiol.* **54**, 260-6(1920).—Organisms from a culture of a ciliate protozoön, *Colpidium*, when exposed to the action of a toxic agent, die in such a way that there is a straight-line relationship between the time and the log of the % of survivors for a large part of the death process. The apparent log law can be interpreted in terms of the variation in the resistance of individuals of the culture. The monomol. law of disinfection proposed by Chick (*C. A.* **2**, 2393) is an admirable working rule provided it remains as such and does not involve the idea that bacteria can be treated as single chem. mols.

J. F. LYMAN

Studies on intestinal implantation of *Bacillus acidophilus*. H. A. CHEPLIN AND L. F. RETTGER. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* **17**, 192-5(1920).—Lactose, dextrin, pure cultures or suspensions of *B. acidophilus*, milk soured with *B. acidophilus*, and combinations of these, when fed to white rats or human subjects in sufficient amts., bring about a profound change in the character of the intestinal flora; within a few days there occurred a complete transformation of the fecal flora from the ordinary mixed type to one strongly dominated by *B. acidophilus*. Maltose, sucrose,

glucose, cultures of *B. bulgaricus*, and *B. bulgaricus* milk failed to bring about such transformation.

V. C. MYERS

Associative bacterial action in the propionic acid fermentation. JAMES M. SHERMAN AND ROSCOE H. SHAW. Bur. Animal Ind. *J. Gen. Physiol.* 3, 657-8(1921).—The propionic acid-producing bacteria, when associated with *Streptococcus lacticus*, *Lactobacillus casei*, or several unidentified non-lactose-fermenting organisms, greatly increased the yield of propionic acid over that obtained when only the pure culture was used. A lactose medium was employed.

CHAS. H. RICHARDSON

Influence of the salts of uranium on the fixation of nitrogen. E. KAYSER. *Compt. rend.* 172, 1133-4(1921); cf. *C. A.* 7, 615; 15, 873; Agulhon and Sazerac, *C. A.* 7, 809, 1736; Stoklasa, *C. A.* 7, 1740.—The object of this study was to det. the action of U salts on the fixation of N by *Azotobacter agile*. Culture media (A) contg. 1.94% of mannitol and (B) contg. 2.06% of glucose, both with the usual mineral salts, were prepd. and 1/15000 or 1/16000 of U acetate or 1/6000 of U phosphate was added. The media were sterilized and inoculated with a generation of *Azotobacter* grown in the dark. The flasks with controls were placed under white and under yellow glass at a temp. of 27°, and the contents analyzed after one month. Under white glass the mannitol cultures receiving uranium acetate sustained a greater loss of carbohydrate and, in the case of the larger amt. of U salt added, there was an increase in the amt. of N fixed over that in the control. Under yellow glass both the carbohydrate consumed and N fixed were much less in the presence of either U salt than in the control. In the glucose medium the presence of 1/15000 of U acetate greatly increased both the consumption of carbohydrate and fixation of N.

L. W. RIGGS

Study of lactose-fermenting yeast present in yeasty cream. B. W. HAMMER AND W. A. CORDES. Iowa Expt. Sta., *Bull.* 61(1921).—These authors examd. yeasty cream from several of the Middle States in the Mississippi Valley. The numerous cultures of yeast isolated from each of the samples belonged to one of two classes designated, resp., as Type A and Type B. The former shows a growth optimum at 37°, the latter at 30°. Type B liquefies gelatin, while Type A affects gelatin but does not truly liquefy it. Type A usually ferments inulin and raffinose, while Type B ferments raffinose but not inulin. They both act similarly towards the other sugars studied. Growth is inhibited at 43°. The nomenclature *Torula cremoris* for Type A, and *Torula sphaerica* for Type B is proposed. Type A predominates in foamy cream and milk. The foaminess has been traced to the associative effect of slight acid coagulation, together with the CO₂ production.

H. F. ZOLLER

D—BOTANY

CARL L. ALSBERG

Investigation of the nitrogenous metabolism of the higher plants. I. The isolation of proteins from leaves. A. C. CHIBNALL AND S. B. SCHRYVER. *Biochem. J.* 15, 60-75(1921).—A suitable extg. medium was found to be water satd. with ether. By warming to 40° flocculation of the colloidal soln. takes place quite rapidly. These ppts. obtained from the leaves of cabbage, scarlet runners and spinach consist for the most part of proteins and contain about 10% of N.

BENJAMIN HARROW

Oxidizing enzymes. IV. The distribution of oxidizing enzymes among the higher plants. M. W. ONSLOW. Biochem. Lab., Cambridge. *Biochem. J.* 15, 107-12(1921); cf. *C. A.* 15, 99.—M. has presented evidence to show that the oxygenases in plants are enzymes which catalyze the autoxidation of aromatic substances having the dihydroxyl grouping of catechol. In the present paper the general distribution of the oxygenase and its aromatic substrate has been examd. The procedure was as follows: The plant tissue is pounded in a mortar with 96-98% alc. and the mixt. filtered on a filter pump. The process is twice repeated with the residue. Sugars, tannins, etc.,

are thereby removed. The enzymes also are pptd., but they can usually be removed by extr. with water. Since removal of enzyme by water is not always easily accomplished, the ppt. is divided into two portions, dil. catechol soln. is added to one, and water to the other. Where oxygenase is present, browning occurs in the catechol soln., and this is followed by a blue color on addition of guaiacum soln. O. examd. 320 species selected from the whole of the group of Angiosperms. Leaves and leafy shoots were nearly always used as material. Enzymes of the oxygenase type were present in the aerial parts of about 62% of the orders of flowering plants examd. So far, no case has been noted in which oxygenase is present and no catechol compd., though the converse is sometimes true. The physiol. significance of the catechol-oxygenase system may probably be traced to respiration processes; to the conversion of mol. into active oxygen, whereby substances produced in respiration are oxidized. V. Further observations of the oxidizing enzymes of fruits. *Ibid* 113-117.—The cherry, peach, apricot, medlar, strawberry, grape, fig and mulberry contained the components of an oxidase; the blackberry, red currant, black currant, gooseberry, grape fruit, pomegranate, pineapple, melon and tomato showed the presence of a peroxidase only. The enzyme content of the fruit is not always the same as that of the plant; for example, blackberry and tomato leaves contain an oxidase, but the ripe fruit does not. BENJAMIN HARROW

Constituents of the bark of *Zanthoxylum macrophyllum*, Oliver. J. A. GOODSON. Wellcome Research Lab., London. *Biochem. J.* 15, 123-8(1921).—*Zanthoxylum macrophyllum*, Oliver (*Fagara macrophylla*, Engler), of the natural order Rutaceae, is a tree 30-40 ft. high, with either spreading or ascending prickles on its leaf-stalks. It is closely related to *Fagara xanthoxyloides*, Lam. Both occur in Upper Guinea. In the present investigation G. has shown that the bark of *Zanthoxylum macrophyllum* contains fagaramide, $\text{CH}_2\text{O}_2\text{C}_6\text{H}_3\text{CH}:\text{CHCONHCH}:\text{CHMe}$, which had previously been isolated by Thoms and Thümen (*C. A.* 6, 864) from *Fagara xanthoxyloides*, thereby further emphasizing the close relationship of the two species. The method of isolation was as follows: the ground bark (32 kilos) was extd. with hot petroleum (b. 35-60°). On standing this deposited a sparingly sol. substance (60.4 g.) which proved to be fagaramide (A). The mother liquors after concn. deposited in several crops 85.9 g. of lupeol, a phytosterol (B). The residue of the petroleum ext. was of a resinous character and contained a substance producing a tingling sensation when applied to the tongue. (The natives use the bark as an analgesic, especially in cases of toothache and rheumatism.) This substance could not be isolated. The crude A on repeated recrystn. from ethyl acetate, yielded colorless six-sided plates, softened 105° and m. 119.5° (cor). It gave Gaebel's test (cf. *C. A.* 4, 2544) for the methylenedioxy group, and readily absorbed two atoms of Br. Analysis gave C 67.8, 67.6; H 7.0, 6.8; mol. wt. 231, 241. Calcd. for fagaramide $\text{C}_{14}\text{H}_{17}\text{O}_2\text{N}$: C 68.0; H 6.9; mol. wt. 247.2. Acid hydrolysis of fagaramide yielded isobutylamine, and alkaline hydrolysis, piperonylacrylic acid. The crude B recrystd. from ethyl acetate gave colorless needles, m. 216° (cor). It gave the color reactions with Ac_2O and H_2SO_4 . Found C 84.6, 84.6; H 11.6, 11.9. Calcd. for $\text{C}_{20}\text{H}_{24}\text{O}$, C 84.4, H 11.9. The acetyl, benzoyl and monobromo deriva. of B were prepd. BENJAMIN HARROW

Action of radium upon growing and resting plant parts, and the application of radioactive preparations in gardening. C. BRICK. *Jahresber. Gartenbauverein.* (Hamburg) 1916, 1-6; *Physiol. Abstracts* 5, 158.—Both the slight illuminating action of Ra, and the phosphorescence produced by that element can produce small, positive phototropic effects on sensitive growing shoots. Ra rays retard the growth of the roots and shoots of germinating seeds, inhibit the formation of starch in a starved leaf, and cause the early opening of winter buds. Ra emanation has a harmful action, retards the growth of both root and shoot, and causes early opening of winter buds, and discoloration and destruction of the leaves; it apparently seriously disturbs the enzymic

activities of the cell, and prevents the utilization of reserve foodstuffs. Ra reduces the number of leaves in the leaf whorl of *Sedum*. The relationship of these phenomena to practical gardening is discussed.

JOSEPH S. HEFBURN

Saponin from the root of *Platycodon grandiflorum*. ANON. *Kyoto Igaku Zasshi* 15, No. 2(1918); *Jap. Med. Literature* 6, 4(1921).—The saponin was obtained by extn. of the finely divided root with warm alc., concn. of the ext., and purification by dialysis and by pptn. with Et_2O . It is amorphous, has a hot bitter taste, m. 220° , is sol. in alkalis, slowly sol. to a slight extent in water to a light yellow soln., insol. in dil. acids, Et_2O , CHCl_3 and C_6H_6 , does not reduce Fehling soln., contains no N, is optically inactive, and forms both an acetyl and a benzoyl derivative. On hydrolysis, it yields a white flocculent residue, while 65.4% of its wt. passes into soln. as *d*-glucose. The saponin possesses hemolytic power. If a drop of concd. H_2SO_4 be added to a soln. of the saponin in concd. AcOH , a reddish brown color is produced.

J. S. H.

Recent advances in science—plant physiology. WALTER STILES. Univ. College, Reading. *Science Progress* 15, 557–61(1921).—Review of recent work on carbon assimilation.

JOSEPH S. HEFBURN

Influence of vitamins on the growth of plants. AUGUST LUMIÈRE. *Ann. inst. Pasteur* 35, 102–23(1921).—Vitamins are not necessary to the development of plants, which reach complete growth in media of known chem. compn., even mineral compn. Org. exts. from substances rich in vitamins, as dried raisins, aided development in media which were low in nutritive value, but their place could be taken perfectly by appropriate addition of mineral salts. *Penicillium glaucum*, *Aspergillus niger*, and *Rhizopus nigricans* and *Amanita muscaria* were used in the expts. Cf. C. A. 15, 546.

E. R. LONG

Selective absorption of ions from balanced solutions. E. PANTANELLI. *Bull. dell'orto botanico della R. Univ. di Napoli* 6, 261–77(1921); *Rend. accad. sci. Napoli* 26, 136–51; cf. C. A. 14, 1842.—In the pure soln. of a salt of concn. slightly less than that of sea water there is, experimenting with sea algae, an increase of permeability compared to sea water to which a small amt. of the same salt has been added. The algae, however, retains the power of absorbing separately and in different quantity the 2 ions of the added salt. This same fact is observed on comparison of a mixt. of equal parts of sea water and of a salt soln. with a mixt. of equal parts of NaCl and of the same salt, both mixts. being of the same concn. slightly less than that of the sea water. Expts. with terrestrial plants establish the fact that the bivalent cations (Ca , Ba) do not hinder the absorption of Mg or K when the ratio between them is 1:10 or 1:20. Here also the roots retain the power of absorbing in different proportions the 2 ions of each salt. Upon placing marine algae in sea water to which small quantities of nutritive salts have been added, it is observed that with respect to the 4 principal cations (K , NH_4 , Mg , Ca) and the 4 principal anions (NO_3 , PO_4 , SO_4 , Cl) the algae exercise their selective power with exactness, fixing the individual ions in a few hrs. entirely independently of their proportions and of their respective electric charges. Similarly when terrestrial plants are placed in nutritive solns. of different compns. in which there is antagonism between several cations or anions the roots within 2 days absorb the individual ions in proportions very different from those in which they are offered and without regard to the relative proportions or to the elec. charges of the respective groups of ions. P. concludes that the unequal absorption of the 2 ions of a salt manifested by all absorbent cells may be confirmed in any soln. irrespective of the phenomena of antagonism between cations and between anions and that antagonism cannot depend simply upon the fact that one ion hinders its antagonist from being absorbed.

ALBERT R. MERZ

The relation between the accumulation of materials and regeneration processes in isolated leaves. S. V. SIMON. *Z. Botan.* 12, 593–634(1920).—Detached leaves of *Sinningia*, with petioles, were cultivated in a mixture of peat and sand. After the

formation of a wound callus roots appear at the end of the stem and then a tuber-like growth develops. The amt. of reducing sugars in the basal part of the stem increases from the time the leaf is detached until the growth of the tuber begins. The tubers are packed with starch. S. considers that a definite concn. of sugar is the stimulus which starts the formation of roots and tubers.

T. G. PHILLIPS

The relation to lignin of crude resin and tannic acid in spruce needles. A. C. VON EULER. *Svensk Pappers-Tid.* **24**, 191-5(1921).—E. continues recent work by Klason on lignin and allied substances. He gives a table of formulas and names with calcd. compn. for probable substances corresponding to percentages actually found. He arrives at the hypothesis that there are first formed in the needles, by assimilation, sugars including pentoses which by loss of water and CO_2 condense to hydroxyconiferyl alc. or variations of the same type which later oxidize to aldehyde. These aldehydes perhaps combine with unchanged alcs. of the cinnamon group, such products being apparently present in resin extd. from the needles. The hydroxyconiferyl alc. then transfers itself to the stems, where by condensation and oxidation it gives rise to tannic aldehyde and tannic acid, the latter going towards the bark and the former towards the inside to form lignin.

W. SEGERBLOM

Lignin substance. K. H. A. MELANDER. *Svensk Pappers-Tid.* **24**, 195-6(1921).—M. reviews a dissertation by I. L. Hochfelder on lignin substance. H. dried spruce chips $4 \times 2 \times 0.4$ cm. to 100° and digested them 48 hrs. at 180° with phenol. The pulp was filtered and the lignin was recovered by distg. the phenol. The residue was extd. with Et_2O . The insol. part was called "lignin substance α " and the ether-sol. part was called "lignin substance β ." H. obtained 23.1% of the former and 18.6% of the latter. Many properties of "lignin substance α " were detd. and the absence of carboxyl and carbonyl groups was established. The presence of 3 hydroxyl groups was shown. An attempt was made to work out a quant. method for the detn. of cellulose.

W. SEGERBLOM

RITZEMA BOS, J.: Plant Life: Experiments and Observations on Some of the Most Important Life Phenomena of Plants. Part II. Reproduction. 2nd Ed. Groningen: J. B. Walters. A book dealing with the biology and physiology of plants.

TSCHIRCH, A.: Die biochemische Arbeit der Zelle der höheren Pflanzen und ihr Rhythmus. Bern. Paul Haupt. 55 pp. Fr. 2.80. For review see *Schweiz. Chem. Ztg.* **23**, II(1921).

E-NUTRITION

PHILIP B. HAWK

NORMAL

Artificial diet with pigeons. The effects of a deficiency of brewers' yeast. H. SIMONNET. *Bull. soc. hyg.* **9**, 69-85(1921).—This paper presents the data obtained in feeding expts. with pigeons. The "complete diet" used consisted of the following: Meat residue 11 g., peanut oil 5 g., potato starch 59 g., salt mixt. 4 g., filter paper 5 g., agar 5 g., butter 10 g., brewers' yeast 1 g. Directions are given for the prepn. and administration of the ration. The salt mixt. was that of Osborne and Mendel. The butter furnished the fat-sol. A factor, whereas the yeast was the only source of the H_2O -sol. B and the antiscorbutic factor. A curve is given showing that the complete diet permits satisfactory maintenance of the birds during the period of the expt., i. e. 170 days. The same ration but without the yeast did not permit maintenance of the birds. Characteristic symptoms of polyneuritis appeared, and these are described in great detail. Eight curves accompany the paper.

A. L. BARKER

The present status of vitamins. KATHERINE BLUNT AND CHU CHE WANG. *J. Home Econ.* **13**, 97-115(1921); cf. *C. A.* **14**, 1135.—A résumé of the progress of research

on this subject. The need of further study along several special lines is pointed out. A bibliography is appended.

HELEN N. ELLIOTT

A note on the absorption of calcium salts in man. EDWARD H. MASON. Royal Victoria Hosp., Montreal. *J. Biol. Chem.* 47, 3-4(1921).—Ca lactate, in 5-g. doses, was given, on a fasting stomach, dissolved in 300 cc. H₂O, in a mixt. of 250 cc. H₂O and 25 cc. 0.05 N HCl, and suspended in 25 cc. codliver oil. There was no appreciable effect on the plasma Ca. The same amt. of CaCl₂ in H₂O or in dil. acid increased the Ca of the plasma by an av. of 2.5 mg. within the following 3 hrs.

I. GREENWALD

The metabolism of the man of the tropics. C. EIJKMAN. *J. physiol. path. gén.* 19, 33-5(1921).—E. calls attention to his studies on the respiratory exchange of tropical men (*Arch. ges. Physiol.* 64, 56(1896)), the results of which he claims fail to show any differences in the basal metabolism of persons living in tropical climates as compared with those living in the temperate zones.

F. S. HAMMETT

Calcium ingestion and calcium equilibrium in man. OSCAR LOEW. *Vierteljahrs. ger. Med.* 61, 151-4(1921).—A critical discussion of Rubner's statement that "a Ca deficiency can only occur when there is a deficiency in foodstuffs." (Cf. Rubner, *C. A.* 15, 1153.) L. contends that Ca equil. depends on the nature of the diet. A high-fat diet means a low Ca assimilation. A decrease in the alkalinity of the blood means a loss of Ca by excretion. A prolonged under-supply of Ca gives rise to diverse pathol. conditions.

F. S. HAMMETT

Reply to Prof. O. Loew. M. RUBNER. *Vierteljahrs. ger. Med.* 61, 155-60(1921).—Cf. preceding abstr.

F. S. HAMMETT

Effect on kittens of a diet deficient in animal fat. H. M. M. MACKAY. Lister Inst., London. *Biochem. J.* 15, 19-27(1921).—In the place of pups used in Mellanby's expts. (*C. A.* 13, 2917), N. used kittens. A typical expt. was carried out with 5 kittens belonging to 3 litters. They were housed and fed in 2 pens (control in one and exptl. animals in other) in a warmed room. They were allowed out for several hours every day. The diet consisted of white bread *ad lib.*, orange juice 1 cc. (hand-fed), alternate days; marmite [a variety of yeast] 2 g. given in milk, whole not consumed. In addition, the control animals received whole milk *ad lib.*, and the exptl. animals machine skimmed milk with 3% olive oil *ad lib.* Both the whole and skimmed milk were brought to a boil and allowed to cool before being given to the kittens—"a proceeding which probably destroys only a very small part of its antiscorbutic value (Barnes and Hume, *C. A.* 14, 1566)." The av. fat value of the skimmed milk was 0.15%. The olive oil had previously been autoclaved, and had been shown to be free of fat-sol. A by expts. carried out on rats. The absence of fat-sol. A in the diet of the exptl. animals gave rise to emaciation, arrest of growth, abdominal distention with (in 2 animals) atrophy of the walls of the stomach and intestines, and changes in the costo-chondral junctions similar to those seen in guinea pigs and rats suffering from deficiency of the same accessory food factor. The appearance presented by these animals was similar to the clinical picture of celiac disease in children. There was no evidence of rickets found in any of the kittens.

BENJAMIN HARROW

Effect of a diet deficient in animal fat on the bone tissue (rib junctions) of kittens. P. M. TOZER. Lister Inst., London. *Biochem. J.* 15, 28-9(1921).—T. examd. the rib junctions of the kittens used by Miss Mackay (see preceding abstr.). The abnormalities at the costo-chondral junction in these kittens do not appear to resemble those characteristic of rickets. They do correspond closely with the changes seen on examn. of the rib junctions of guinea pigs fed on diets deficient in fat-sol. A. The changes produced at the costo-chondral junction in the guinea pig by the deprivation of fat-sol. A is indistinguishable from those caused by definite, but not severe, scurvy. (See also Delf and Tozer, *Biochem. J.* 12, 4(1918).)

BENJAMIN HARROW

Comparison of the growth-promoting properties for guinea pigs of certain diets,

consisting of natural foodstuffs. E. M. HUMG. Lister Inst., London. *Biochem. J.* 15, 30-48(1921).—Young growing guinea pigs about 320 g. wt. were fed with a mixt. of oats and wheaten bran *ad libitum*, but weighed. To this was added the food to be tested in weighed or measured quantities; the residues were either fed by hand or were measured and the quantity actually consumed was calcd. Whenever necessary, extra antiscorbutic in the form of orange juice was added. Growth took place when green cabbage (raw or steamed), green cabbage juice, hay and milk (raw, heated or dried) were added to a diet of oats and bran and water. The growth varied according to the size of the ration given. Raw white cabbage, white cabbage juice, swede juice, orange juice, onion or germinated peas produce little or no growth. The growth-promoting factor in these expts. corresponds in its distribution among foodstuffs with the known distribution of vitamin A. "As a result of these expts. guinea pigs are recommended for trial, as suitable for testing the vitamin A value of non-fatty foodstuff, for which rats are for any reason unsuitable."

BENJAMIN HARROW

Determination of the minimum dose of some fresh citrus fruit juices which will protect a guinea pig from scurvy, together with some observations on the preservation of such juices. A. J. DAVEY. Lister Inst., London. *Biochem. J.* 15, 83-103(1921).—The method employed was that described by Chick, Hume and Skelton (*C. A.* 12, 2609) and Delf and Tozer (*C. A.* 13, 1492). Guinea pigs weighing about 340 g. at the beginning of the expt. were fed on a basal diet of oats and bran and 60-90 cc. cow milk autoclaved at 120° for an hour. The fruit juices tested were given in daily doses, administered by pipet. All food residues were weighed or measured. The presence of hemorrhages was taken as the decisive symptom in diagnosing scurvy. To avoid the acid effects of the juices, they were first partially neutralized with solid Na_2CO_3 . The minimum daily doses needed to protect a guinea pig from scurvy were, lemon 1.5 cc., orange 1.5 cc., lime 5 cc. Preservation with "sulfite" (potassium metabisulfite) is satisfactory at 0°, but uncertain at room temp. and useless at 37°. Preservation with the rind oil, in case of lemon and orange is satisfactory at 0° and room temp. Even after two yrs. the loss in antiscorbutic value is not very great. But if it is kept at 37° rapid deterioration takes place. The preservation of oranges and lemons in a chilling (not freezing) cold store makes it probable that the antiscorbutic property of these fruits is thereby not seriously diminished, provided the fruit is edible.

B. H.

Effect of diet on mammary secretion. G. A. HARTWELL. King's College for Women. London. *Biochem. J.* 15, 140-62(1921).—These expts. were conducted with rats. "When the mother is given a good diet, for example, bread and whole milk, the baby rats at the end of lactation weigh twice as much as when she receives a poor diet, for example, bread only. Extractives tend to keep up the mother's weight. Protein has a similar effect. Excess of protein causes the milk supply to cease after some time. Excess carbohydrate appears to have no effect at all. Absence of fat seems to make no difference, but its presence in excessive quantities has a slightly depressing effect on the growth of the litter. During the normal period of lactation the mother can supply the three types of vitamins."

BENJAMIN HARROW

Antiscorbutic value of dried milk. HARRY JEPHCOTT AND A. L. BACHARACH. *Biochem. J.* 15, 129-39(1921).—Four series of expts. were undertaken. In the first three, comparison was made of summer milk, winter milk, and winter milk neutralized with NaHCO_3 before drying. All three were dried by the roller process, in which the milk is in contact with the source of heat for not more than 3 sec. The fourth variety was full-cream milk dried by the spray process; this variety of milk is subject to prolonged heating (see Hart, Steenbock and Smith, *C. A.* 13, 1724). The compn. of the four varieties of milk powder varied but little; they each contained in the neighborhood of 3-4% of moisture, 5.5-6.5% of ash, 26-28% of fat, 35-37% of lactose, and 25-27% of protein. The guinea pigs were fed with the usual scorbutic diet of oats and

bran, and the milk was added in the form of a thin cream by mixing the powder with three times its weight of hot water. The results may be summarized as follows:

	Summer milk.	Winter milk.	Neutralized milk.	Spray milk.
Under experiment	9	11	4	12
Developed scurvy	2	3	3	12
Survived, or died of causes other than scurvy	6	9	1	—

These results are not in accord with Barnes and Hume (*C. A.* 14, 1363) and Chick, Hume and Skelton (*C. A.* 12, 2809).

BENJAMIN HARROW

Investigation of the antiscorbutic value of full cream sweetened condensed milk by experiments with monkeys. E. M. HUMR. Lister Inst., London. *Biochem. J.* 15, 163-66(1921); cf. *C. A.* 14, 1363.—The milk used was that prepd. by the Nestlé Anglo-Swiss Condensed Milk Co. Its method of prepn. is to heat pooled full cream milk in a vessel with continuous inflow and outflow, at a temp. of 80°. The milk remains at this temp. for about 3½ min. The sugar is next added, and at this point there is access of air. The milk next passes to a vacuum condenser where it boils at about 50° for about 3 hrs., and is drawn off where it passes a certain viscosity test. It is then cooled in bulk, and here again it is exposed to the air. The expts. demonstrated that there is no loss of antiscorbutic potency in this condensed milk. This is attributed to the fact that the milk is concd. *in vacuo*, and it has recently been shown by Hopkins (*C. A.* 14, 3096) and Delf (*C. A.* 14, 2016) that vitamins are not so much susceptible to heat as to oxidation.

BENJAMIN HARROW

The effect of temperature and of hydrogen-ion concentration upon the rate of destruction of antiscorbutic vitamin. V. K. LAMER, H. L. CAMPBELL and H. C. SHERMAN. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* 18, 122-3(1920).—Feeding expts. were conducted upon 300-g. guinea pigs fed a basal diet containing optimum amts. of all nutrients except the antiscorbutic vitamin. This was supplied exclusively in the form of filtered canned tomato juice. Relative amts. of vitamin in treated and untreated portions of juice were measured by detg. amts. required to prevent scurvy or by a quant. rating of the severity of the scurvy produced. Boiling tomato juice of natural acidity p_H 4.2 for one hour destroyed 50% of its antiscorbutic vitamin; four hours' boiling destroyed 70%. The time curve of the destruction process is, therefore, much flatter than that of a unimol. reaction. This finding is applicable to similar heating expts. at 60° and 80°. In such expts. at 60° to 100°, the temp. coeffs. are relatively low (Q_{10} = 1.1 to 1.3). Juice neutralized in whole or in part, boiled one hour, cooled and reacidified at p_H 5.1 to 4.9 (natural acidity less than half neutralized) shows a destruction increased to 58%. By neutralizing a larger proportion of the natural acidity, the rate of destruction of the vitamin at 100° regularly increased. Juice to which alkali was added at an initial p_H of 11, which fell to about 9 during the hour of heating, was immediately cooled and reacidified. By feeding such treated juice it was shown that destruction increased to 65%. Repetition of the latter expts. with reacidification omitted and treated juice stored up to five days in the refrigerator before feeding showed 90 to 95% destruction. It was uncertain whether the difference between reacidified and non-reacidified juices is due wholly to prolonged action of hydroxyl ions at a temp. of 10° and p_H only 9, or whether other factors, possibly a tendency toward reversal of the destructive process upon reacidification, are involved.

B. H.

Nutritive ratio of the infant's ration. JOHN ZAHORSKY. *Arch. Pediatrics* 38, 292-5(1921).—Human milk of av. compn. has a nutritive ratio 1:13. In infant feeding, the ration must have a nutritive ratio of not less than 1:8; and most infants thrive better on a ration with a nutritive ratio 1:6.

JOSEPH S. HEPBURN

Metabolism and growth from birth to puberty. FRANCIS G. BENEDICT AND FRITZ B. TALBOT. *Carnegie Inst. Pub.* 302, 219 pp.(1921).—Both boys and girls show a continually increasing metabolism from birth to the 13th year of age. The total basal heat production in 24 hrs. shows a general increase with increasing body surface and increasing body wt. Both sexes have the same metabolism from birth until the body wt. attains 11 kg., thereafter, boys tend to have somewhat higher metabolism than girls of the same wt. Likewise, when the area of the body surface is above 0.48 m.², a boy has a higher metabolism than a girl of the same body surface. In predicting the metabolism of children from curves, results closer to the actual heat production are obtained from curves based on body wt. than from those based on body surface; this is true for both sexes, especially if the body wt. exceeds 10 kg. The linear formula of Dubois for calcul. of surface area of the body may be applied to children weighing 6.27 kg. or less. The surface area may also be obtained by multiplication of the cube root of the square of the body wt. by a const. This const. (*K*) varies in numerical value with the body wt. and the sex. In the case of boys, *K* is 10.0 for body wts. up to 6 kg., 10.6 for wts. between 6 and 15 kg., 11.2 for wts. between 15 and 25 kg., 11.5 for wts. between 25 and 40 kg. In the case of girls, *K* is 10.1 for body wts. up to 6 kg., 10.6 for wts. between 6 and 10 kg., 10.8 for wts. between 10 and 20 kg., and 11.1 for wts. between 20 and 40 kg. The study also included detns. of pulse rate, rectal temp., ratio of age to body wt., of age to height, and of body wt. to height in both boys and girls from birth to puberty.

JOSEPH S. HEPBURN

Deficiencies in diet as related to nutrition and growth. E. V. McCOLLUM. Johns Hopkins Univ. *Dental Cosmos* 63, 596-9(1921).—A discussion of satisfactory and deficient diets with special reference to protein, mineral ingredients, and vitamins. The org. factor of unknown chem. nature which plays a role in the etiology of rickets is possibly a distinct identity, a fourth unidentified dietary factor or vitamin.

JOSEPH S. HEPBURN

Action of magnesium sulfate administered subcutaneously upon the calcium and magnesium balance of sucklings. ER. SCHIFF. *Jahrb. Kinderheilk.* 91, 43-50 (1920); *Physiol. Abstracts* 5, 188.—CaO and MgO were detd. in the food, urine, and feces of 3 infants during periods of 4 days each, before and after subcutaneous administration of 0.2 g. MgSO₄ as a 10% soln. The injection produced a loss of Ca in 2 healthy infants while they retained from 1/2 to 2/3 of the Mg administered. The third patient was a rachitic child; it showed increased elimination of Ca in the urine compensated by decreased Ca elimination in the feces, while practically all the injected Mg was retained.

JOSEPH S. HEPBURN

Cooking and vitamins. ELLEN MARION DELF. *Science Progress* 15, 601-12(1921).—Sections are devoted to the properties and distribution of vitamins, influence of heat on the antiscorbutic vitamin, methods of cooking vegetables, pulses (peas, beans, and lentils), and fruits, and of preserving fruits and vegetables. These deductions are drawn: The heating involved in cooking should be not more than sufficient to sterilize and soften the food; over-cooking and "keeping hot" should be avoided especially with fruit and vegetables. "In times of scarcity of butter, milk or animal fats, salads, and lightly cooked green vegetables, and also carrots should be increased in the diet, together with fat fish, (herring, mackerel, or salmon), or, in the case of children, cod liver oil." When fruits and vegetables are scarce, they may be replaced by *germinated* pulses or cereals. Fruit supplies only the antiscorbutic vitamin; vegetables supply both the antiscorbutic and the growth-promoting vitamin. Approx. 0.5 lb. of vegetables supplies the daily requirement of an av. man doing full work. The juice of a medium-sized orange or lemon, or a fairly large fresh tomato daily provides sufficient antiscorbutic vitamin for the av. adult. Cf. C. A. 14, 2016.

JOSEPH S. HEPBURN

The chemical composition of the Rankin farm pellagra-producing experimental

diet. M. X. SULLIVAN AND K. K. JONES. U. S. Health Service. *Hyg. Lab. Bull.* 120, 117-28(1920).—The total quantity of protein, carbohydrate, fat and ash available per man per day during a week of the expt. by Goldberger and Wheeler in which they were able to produce symptoms resembling pellagra in the human being was as follows: protein, 40.36 g.; carbohydrates, 461.58 g.; fat, 108.76 g.; ash, 29.99 g. The calorific value on this basis would be 3069.5 cal. The NaCl added to the foods in cooking is estd. as 19.61 g. per man per day.

JULIAN H. LEWIS

A biological study of the diet resembling the Rankin farm diet. M. X. SULLIVAN. U. S. Pub. Health Service. *Hyg. Lab. Bull.* No. 120, 127-40(1920).—The pellagra-producing diet of the Rankin farm expt. was lacking in antineuritic principles as detd. by feeding expts. in hens.

JULIAN H. LEWIS

Studies on the digestibility of proteins in vitro. I. The effect of cooking on the digestibility of phaseolin. HENRY C. WATERMAN AND CARL O. JOHNS. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* 46, 9-17(1921).—The increased efficiency of cooked phaseolin (supplemented with cystine) in inducing normal growth in rats reported by Finks and Johns (C. A. 14, 3430) lies apparently in the fact that it is rendered more digestible by boiling in distd. H₂O. A detectable increase in digestibility is brought about by boiling for 5 min. and the max. effect is produced by 45 mins. cooking. The digestibility of the various products was detd. *in vitro* by digesting with pepsin and trypsin and detg. the extent of proteolysis by ascertaining the amt. of amino N in the filtered reaction mixts. If the calcn. is based upon the total amino N of the protein found after complete hydrolysis, and if a correction is made for the small % of free amino N present in the unhydrolyzed protein, the method furnishes a means whereby gross differences in the digestibility of proteins may be readily detected. The method is being further investigated with the view of making it approx. quant.

A. P. LOTHROP

Studies on the synthesis of hippuric acid in the animal organism. IV. The synthesis of hippuric acid in the rabbit after exclusion of bile from the intestine. HOWARD B. LEWIS. Univ. Penn. *J. Biol. Chem.* 46, 73-5(1921).—Hippuric acid synthesis in the rabbit occurs after the exclusion of bile from the intestine, so that the glycocholic acid of the bile is not the only source of glycocholl in the rabbit. The % eliminated was smaller than normal but it was not possible to det. whether the decreased elimination was due to the poor physical condition of the animal or to the effect of the exclusion of bile.

A. P. LOTHROP

The vitamine content of honey and honey comb. P. B. HAWK, C. A. SMITH AND O. BERGHEIM. Jefferson Med. College. *Am. J. Physiol.* 55, 339-48(1921).—Strained honey does not appear to contain appreciable amts. of fat-sol. A, water-sol. B, nor water-sol. C vitamins. Honey comb contains fat-sol. A in moderate amts.

J. F. I.

Studies in nutrition. V. The nutritive value of soy bean flour as a supplement to wheat flour. C. O. JOHNS AND A. J. FINKS. Bur. Chem., U. S. Dept. Agr. *Am. J. Physiol.* 55, 455-61(1921); cf. C. A. 14, 3100.—Feeding trials with rats show that bread made with 25% soy bean flour and 75% wheat flour or from 15% soy bean flour and 85% wheat flour supplied proteins and water-sol. B vitamins in amts. adequate for normal growth. The mixed proteins are 2 or 3 times as efficient for growth as wheat proteins alone.

J. F. LYMAN

The nutritive value of yeast in bread. P. B. HAWK, C. A. SMITH AND O. BERGHEIM. Jefferson Med. College. *Am. J. Physiol.* 56, 33-9(1921).—"Standard" bread contg. about 10% of the total protein in the form of milk proteins was inadequate for the support of normal growth in white rats. The addition of 5% of yeast powder gave a much more efficient ration. The value of yeast as a constituent of food products is emphasized.

J. F. LYMAN

The supposed identity of the water-soluble vitamine B and secretin. G. V. AN-

REP AND J. C. DRUMMOND. Univ. College London. *J. Physiol.* **54**, 249-52(1921).—Yeast ext. does not cause secretion of pancreatic juice as does secretin. Secretin can be extd. from the intestine of a cat showing the so-called polyneuritic condition to a very marked degree. Attention is called to the fact that vitamine B has a powerfully curative effect on polyneuritic animals when given by the mouth, whereas secretin has no action on the secretion of pancreatic juice when so administered. The suggestion of Voegtlin and Myers (*C. A.* **14**, 1156) that vitamine B and secretin are identical is not supported. J. F. LYMAN

Vitamines and lipid metabolism. W. CRAMER. *Proc. Physiol. Soc.; J. Physiol.* **54**, ii(1920).—C. describes "lipoid gland tissue" found in the white rat (1) at the back of the shoulders between the scapulae, (2) in the thorax along the aorta, (3) in the abdomen between the kidneys and the abdominal aorta and surrounding the adrenal glands which lie imbedded in it. In rats dead as a result of vitamine-free diets, both fats and lipoids may be completely lacking in this tissue. It is suggested that this lipoid gland tissue forms an important deposit of one or more of the vitamins. J. F. LYMAN

Blood sugar curves with glucose, lactose, maltose, mannitol and cane sugar. C. W. FIELD. *Proc. Soc. Exptl. Biol. Med.* **17**, 29-30(1919).—These curves were obtained by feeding normal males (colored), with 100 g. of the pure sugar, on a fasting stomach. A sample of blood was taken just before and 1, 2, and 3 hrs. after the ingestion of the sugar, which was dissolved in a large glass of water. None of the urine specimens, taken up to 3 hrs. after the last sample of blood, showed the slightest trace of reducing substance with Benedict's qualitative soln. The glucose curve was typical, rising to its highest point 1 hr. after the ingestion, dropping to normal at the end of the 2nd or 3rd hr. Maltose and mannitol gave the same time curve as glucose, but with mannitol the av. rise was only 10 mg. per 100 cc. blood, while the rise for glucose was 40 mg. and for maltose 34 mg. Cane sugar showed a curve that reached its height at the end of the 2nd hr. and had dropped to normal at the end of the 3rd hr. Its av. rise was 20 mg. per 100 cc. blood. Lactose shows the same time curve as cane sugar, but its rise is very slight, 4 mg. per 100 cc. blood. V. C. MYERS

Do fruits contain water-soluble vitamine? T. B. OSBORNE AND L. B. MENDEL. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* **17**, 46-7(1919).—Expts. were begun on rats in whose diet fruits and fruit juices furnished the sole source of H₂O-sol. vitamine. More than 5 g. per day of fresh apples and pears avert the characteristic decline in wt. observed where vitamine-free diets devoid of H₂O-sol. vitamine are used. The fruits are too bulky to permit the feeding of more than 10 g. per day. Ten cc. of orange juice per day suffice to promote considerable growth. The inner peel of the orange (which Hess has found to be antiscorbutic) seems also to contain some of the other H₂O-sol. vitamine. It is evident that the proportions of the latter in the fruits tested is not large in relation to the quantities edible. Cf. *C. A.* **14**, 3101. V. C. MYERS

The role of fat-soluble vitamine in the dietary of infants. A. F. HESS AND L. J. UNGER. State Lab., Dept. Health, New York. *Proc. Soc. Exptl. Biol. Med.* **17**, 49-50(1919).—As a result of feeding expts. and clinical reports, it has been accepted that fat-sol. vitamine is highly important for man, and that the lack of it leads to nutritional disorder in children. To study this question 5 infants ranging in age from 5 to 12 months, were given a diet complete except for a very small amt. of fat-sol. vitamine. It consisted of 180 g. daily of skimmed milk, (0.2% fat), 30 g. cane sugar, 15 to 30 g. autolized yeast, 15 cc. orange juice, 30 g. cottonseed oil, and cereal for the older infants. On this diet the infants have done well for 8 to 9 months. H. and U. believe that either a very small amt. of this vitamine suffices to supply the needs of human nutrition, or that this deficiency has to be maintained for a period of years to bring about harmful result. Infants fed on this diet did not develop signs of rickets. This disorder developed in infants receiving large quantities of milk containing ample fat-sol. vitamine. The

authors do not believe that rickets is brought about by the lack of this principle. Cf. *C. A.* 14, 3709. V. C. MYERS

Additional experiments showing the production of fat from protein. G. LUSK. Cornell Univ. Med. Coll. *Proc. Soc. Exptl. Biol. Med.* 17, 171-2(1920).—The respiratory quotients for the 5th, 6th and 7th hrs. after 1000 g. meat were given to a dog were 0.842, 0.845, and 0.845. Computed from the urinary N of 1.44 g. per hr. there seemed to be a retention of material derived from protein which, if burned, would show quotients of 0.708, 0.688, and 0.685. This material retained in the body thus had a quotient about the same as fat. By direct calorimetry 85.32 calories were found for the 3 hrs. By indirect calorimetry, if the retained C be calcd. as being deposited as fat, 83.58 calories may be expected to arise; if it had been deposited as glycogen a greater heat production would be expected. V. C. MYERS

An observation on the effect of a protein meal given to a man at the end of an eight-day fast. W. S. McCANN. Russell Sage Inst. and Bellevue Hosp. *Proc. Soc. Exptl. Biol. Med.* 17, 173-5(1920).—Normal basal respiratory quotients of 0.733 and 0.723 were obtained from a man after an 8-day fast; for a 3-hr. period beginning 1 hr. after he was given 350 g. lean beef and 10 g. butter, quotients of 0.687 and 0.681 during the first 2 hrs. and of 0.740 were obtained for the 3rd hr. The quotients of the first 2 hrs. after the meal are similar to those found in severe diabetes though the man was not diabetic. The expt. was repeated after the patient had taken a normal diet for a wk. and normal quotients were found. Probably the low quotients in the 1st case were obtained by the same mechanism as in diabetes, except that the glucose was stored as glycogen instead of being excreted. V. C. MYERS

Studies in pyrimidine metabolism. D. W. WILSON. Johns Hopkins Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 179-80(1920).—Uracil nucleoside administered to rabbits caused increased urea and undetd. N excretion. As much as 20% of the uracil fed was excreted as uracil. A mixt. of cytosine and uracil nucleosides produced increased urea excretion, but usually no increase in undetd. N. Uracil was excreted infrequently. No excretion of pyrimidines occurred after feeding of yeast nucleic acid. It is shown that more uracil appears in the urine when simpler complexes containing the uracil group are fed. Therefore, probably in the metabolism of yeast nucleic acid, before the pyrimidine or nucleoside is liberated, the pyrimidine is altered so that it may be further broken down into urea. V. C. MYERS

The rate of growth of the dairy cow. Extrauterine growth in weight. SAMUEL BRODY AND ARTHUR C. RAGSDALE. Agr. Expt. Sta., Columbus, Mo. *J. Gen. Physiol.* 3, 623-33(1921).—There are 3 cycles in the growth period of Jersey and Holstein cows; 2 extrauterine cycles with max. at 5 and 20 months and an intrauterine cycle of undetd. max. The equation of an autocatalytic monomol. reaction was found to express closely the cycle with a max. at 5 months, but the values obtained with this equation for the cycle with a max. at 20 months were higher than the observed values probably because of the retarding effects of pregnancy and lactation on growth. C. H. R.

ABNORMAL

The role of acids in carbohydrate metabolism. IV. The relation of acids and alkalies to adrenaline glucosuria. H. ELIAS AND U. SAMMARTINO. *Biochem. Z.* 117, 10-40(1921).—Acid glucosuria differs from that produced by puncture or adrenaline in that it causes no increase in vol. of the liver. Subcutaneous adrenaline injection produces a marked acidosis in rabbits and a 3-fold increase in the lactic acid content of the liver. This increase in lactic acid production begins within the first hour after the adrenaline injection and lasts for at least 3.5 hrs. Further perfusion expts. on livers of cold-blooded animals showed that the sugar mobilization effect of adrenaline is inhibited by alkali. This inhibition can be removed if the alkali is neutralized by

acid. It is, therefore, concluded that the acid produced by the injection of adrenaline is an important factor in the origin of the subsequent glucosuria. F. S. HAMMETT

Value of calcium caseinate milk in fermentative diarrhea. ADOLPH G. DE SANCTIS AND LILLIAN V. PAIDER. *Arch. Pediatrics* 38, 233-6(1921).—Ca caseinate contains 97% casein and 3% Ca. It is usually used in the ratio of $\frac{1}{2}$ oz. to 16 oz. whole milk and 16 oz. water, yielding a ration contg. 1.7% fat, 2.2% carbohydrate, and 3.4% protein. When this ration is used in fermentative diarrhea of infants, the stools, which have been excessive in frequency, decrease in number and are restored to the normal yellow color and firmness in 2 to 5 days. The low-carbohydrate and high-protein ration causes a change in the bacterial flora of the intestine, and thereby produces changes in both the stool and the systemic symptoms. This ration is used for 5 to 8 days.

JOSEPH S. HEPBURN

Glyoxalase in avian beriberi. G. M. FINDLAY. *Biochem. J.* 15, 104-6(1921).—The belief that in the absence of vitamine B and the subsequent development of beriberi there is a breakdown in metabolism, more particularly in regard to the metabolism of carbohydrates, has led F. to det. the glyoxylase content of the liver in avian beriberi: for glyoxylase plays an important part in carbohydrate metabolism. The glyoxylase was estd. by the method employed by Dakin and Dudley (cf. *C. A.* 7, 2228, 3343), wherein a 20% aq. ext. of the tissues acts on phenylglyoxal, converting the latter to mandelic acid, and this is then extd. and estd. by titration in terms of 0.1 N NaOH. In F.'s expts. 15 cc. of a 20% tissue ext. acted on 0.1 g. of phenylglyoxal for 24 hrs. at 37°. The av. of four estns. was: control pigeons 4.4, beriberi pigeons 1.6, "cured" pigeons 3.1 (the numbers refer to cc. of 0.1 N NaOH). This suggests that in pigeons suffering from beriberi there is, as compared to control birds, a reduction in the glyoxalase content of the liver. The administration of vitamine B produces a definite increase in the amt. of glyoxylase. The addition of vitamine B, in the form of 3 g. of yeast ext., to a mixt. of phenylglyoxal and an aq. ext. of the liver of beriberi pigeons, which was then allowed to stand for 24 hrs. at 37°, gave a titration value of 1.72, a result scarcely differing from that found in beriberi birds. "Vitamine B can thus only lead to an increased production of glyoxalase when it acts through the intact cell; it cannot, therefore, be regarded as a true co-enzyme of glyoxalase. BENJAMIN HARROW

Studies on experimental rickets. III. A pathological condition bearing fundamental resemblances to rickets of the human being resulting from diets low in phosphorus and fat-soluble A; the phosphate ion in its prevention. P. G. SHIPLEY, E. A. PARK, E. V. MCCOLLUM AND NINA SIMMONDS. Johns Hopkins Univ. *Bull. Johns Hopkins Hosp.* 32, 160-6(1921); cf. *C. A.* 15, 882.—"Two diets, which were low in their content of fat-sol. A and P, produced in the majority of the young rats placed upon them pathological conditions of the skeleton having a fundamental resemblance to rickets. The pathological conditions produced are not identical, however, with that disease as it usually manifests itself in the human being. The chief difference consisted in the presence of scattered or irregular deposits of Ca salts in the cartilage and metaphysis. The pictures bore a marked resemblance to those seen in rachitic children in whose bones incomplete healing has taken place. When the deficiency in P is compensated for by the addition of a complete salt mixt. containing PO_4 ion, the deficiency in fat-sol. A still existing, no pathological changes of a rachitic nature developed. The addition of the PO_4 ion to the diets deficient in it and in the org. factor prevented, therefore, the development of any changes of a rachitic-like nature. The expts. reported are not sufficiently numerous or comprehensive to permit generalizations concerning the effects of deficiencies of the fat-sol. A and P or of the fat-sol. A alone. The implication of the expts. is, however, plain. The PO_4 ion in the diet may be the detg. influence for or against the development of rickets. If the PO_4 content of the diet is sufficiently high, a deficiency of fat-sol. A cannot cause rickets-like changes in the skeleton. A defi-

ciency in fat-sol. A cannot be the sole cause of rickets. Conversely, it is necessary that the diet be low in its content of P, all other factors, except fat-sol. A, being optimal, for rickets-like conditions to develop. Since the addition of the PO_4 ion to the diet prevented the development of the rickets-like changes in the skeleton, but had no effect in preventing xerophthalmia, it seems permissible to infer that xerophthalmia and rickets do not have an identical etiology. The above results do not in our opinion exclude the fat-sol. A from consideration as an etiological factor in the production of rickets and kindred conditions, since the level of the blood PO_4 is, in all probability, detd. in part by the amt. of the fat-sol. A available for the needs of the organism." A. P. LOTHROP

Studies in the diastatic activity of the blood and blood sugar curves indicating a decreased carbohydrate tolerance in hyperthyroidism. J. A. KILLIAN. N. Y. Post-Graduate Med. School and Hospital. *Proc. Soc. Exptl. Biol. Med.* 17, 91-3(1920).—In a series of 23 cases presented, hypoglycemia, decreased diastatic activity, and low blood sugar curve after glucose ingestion were noted in dispiritualism of the Frölich type, in acromegaly, and in Addison's disease; in hyperthyroidism, on the other hand, the findings with these three tests were above normal. V. C. MYERS

Dietaries of infants in relation to the development of rickets. A. F. HESS AND L. J. UNGER. Home for Hebrew Infants, N. Y. *Proc. Soc. Exptl. Biol. Med.* 17, 220-1(1920).—Many diets supposed to be conducive to rickets were found to result in normal nutrition of infants. Condensed milk only exceptionally induced rickets. A "protein milk" made by pptg. buttermilk with heat regularly led to rickets. It contained 3.3% protein; 2.5% fat; 6.6% CH_2O ; 0.44% ash, in which Ca and P stood midway between that of human and cow milk; its Na content was even higher than in cow milk. Its fat-sol. vitamine content was high, H_2O -sol. vitamine low. V. C. MYERS

Factors influencing the nutritive value of lard and lard substitutes (DRUMMOND) 12. The available carbohydrate in thrice boiled vegetables (O'REILLY, McCABE) 12.

F—PHYSIOLOGY

ANDREW HUNTER

Some effects of altitude on the human body. A. REEVE HEBER. Bristol. *Lancet* 1921, I, 1148-50.—High altitude makes for health in both native and European, until in the latter the nervous system begins to break down. The most serious effects of a long stay in altitudes are felt by the nervous system, and correspond with the acute effects observed in airmen. Altitude has a tendency to enlarge the right heart but not the left. The blood pressure is decreased but the pulse pressure is increased. The thorax expands and the lung tissue increases. Breathing is somewhat accelerated, while the ability to hold the breath is much reduced. An increase in red blood cells occurs, but this is more marked in those who have come from lower latitudes than in the indigenous population. The total and differential counts remain much the same. Prolonged residence tends to decrease the hemoglobin %. E. B. FINK

The distribution of phosphoric acid in the blood of normal infants. G. M. McKELLIPS, I. M. DEYOUNG AND W. R. BLOOR. Univ. Calif. *J. Biol. Chem.* 47, 53-8 (1921).—By Bloor's methods (*C. A.* 12, 2588, 2615) the following results in terms of mg. H_3PO_4 per 100 cc. were obtained for the oxalated ext. (the oxalated or citrated blood of 23 normal infants of both sexes from birth to 26 days of age) Plasma: Total, 18.5-43.0, av. 29.7; acid-sol. 8.8-25, av. 16.5; inorganic, 3.7-13.9, av. 9.6; lipid 10.1-21.4, av. 14.8; organic 1.3-11.4, av. 7.0. Corpuscles: Total, 186.5-284.0, av., 241.4; acid-sol., 135.0-221.0, av. 179.6; inorganic, 9.4-26.7, av. 14.3; lipid, 42.7-74.8, av. 56.0; organic 121.5-204.5, av. 156.0. I. GREENWALD

Gastric secretion in man with particular reference to psychic influences. I. Amount of juice and its digestive strength. G. R. HEYER. *Arch. Verdauungskrankheiten* 27, 227-240(1921).—H. put his patient to sleep by suggestion, then removed the stomach

contents, tested its acidity, and by hypnotic suggestion or "psychic" feeding of blood, milk or bouillon for 2.5 mins. produced an increase in gastric secretion accompanied by an increase in proteolytic activity. These psychically induced alterations lasted for only a few mins. and not for hrs. as Pavlov reported in his studies; but they are none the less striking.

F. S. HAMMETT

The influence of the season on glycogenesis. F. MAIGNON. *J. physiol. path. gén.* 19, 13-32(1921).—M. reports variations in the glycogen content of the muscles and liver of various animals which he considers as seasonal and as related to the seasonal activity of the genital glands. In the carp, the only max. of muscular glycogen content occurs in the spring at the time of reproduction. The dog has 2 periods of sexual activity, spring and fall, and the curve of glycogen content of the muscles rises markedly in the former and less so, but significantly in the latter. In the pigeon, which reproduces through the year, there is always an abundance of muscular glycogen. The guinea pig which has an exacerbation of sexual activity in the spring also has a rise in glycogen content of its muscles at the same time. However, M. does not deny that there may be a temp. effect as well.

F. S. HAMMETT

Climatological studies. I. The active factor of high climates. OTTO KESTNER. *Z. Biol.* 73, 1-6(1921).—Expts. are reported in which dogs were made anemic by bleeding or pyrodine administration and then the effects of low pressure and intense illuminations on the regeneration of the red blood corpuscles was studied. The results which are presented in curves show that the active factor in blood regeneration at high altitudes is not the low O₂ content of the atm. but is the increased sunshine. Its action is considered as being indirect, and of the nature of producing in the air substances, which when breathed in, stimulate corpuscular formation. **II. The action of rays on the blood pressure.** *Ibid* 7-9. —If the atm. surrounding an Hg-arc lamp is drawn through a tracheal cannula into the respiration of an anesthetized dog a fall in blood pressure takes place. This also happens when patients are exposed to the vapors from a lamp of this type, but not when they are exposed to the radiation alone. The phenomena are taken to indicate that the effect of bright sun-rays on blood regeneration is not direct on the organism, but indirect through the production of some compd. as yet unknown.

F. S. HAMMETT

Changes produced in the blood of guinea pigs and rabbits by feeding with fresh ox spleen. A. BRINCHMANN. *Acta Med. Scandinavica* 52, 689-772(1920); *Physiol. Abstracts* 5, 226-7.—A considerable reduction in the count of both erythrocytes and leucocytes occurred in normal rabbits and guinea pigs which were fed fresh ox spleen. This change did not occur in animals which were fed a similar amt. of raw flesh in which the Fe content had been adjusted to that of the spleen. In anemic animals, the spleen acts like other Fe preps., decreases the destruction and favors the regeneration of the blood cells.

JOSEPH S. HEPBURN

Comparative hemolysin formation in male and female rabbits. K. OHNARA. *Chuo Igakkai Zasshi* No. 276, 1387-8(1918); *Japan Med. Literature* 6, 18(1921).—Formation of hemolysin was greater in pregnant females and castrated females than in normal males and non-pregnant females. Cessation of the internal secretion of the ovaries gave rise to the increased formation in both the pregnant and the castrated females.

JOSEPH S. HEPBURN

Findings in the spinal fluid of men free from nervous disease. W. SCHÖNFELD. *Deut. Z. Nervenkrankh.* 64, 300(1919); *Physiol. Abstracts* 5, 127.—The spinal fluid was obtained from 127 subjects free from nervous diseases. The cell count per cc. is 0 to 5 in normal individuals, 6 to 10 in border-line cases, and above 10 in pathological conditions. A trace of globulin is normally present. Both the cell count and the globulin content are increased by repeated punctures.

JOSEPH S. HEPBURN

Structure of the erythrocytes of man and the higher animals. C. GOLGI. *Haema-*

tologica (Napoli) 1920, 1-16; *Physiol. Abstracts* 5, 125.—By use of special reagents and technic in the process of fixation, the erythrocytes are found to contain a reticulo-fibrillar app. which has not hitherto been recognized. JOSEPH S. HEPBURN

Distribution of glycogen granules in skeletal muscles. S. TAKENUCHI. *Iji Shimibun* No. 996, 533-43(1918); *Jap. Med. Literature* 6, 13(1921).—Study was made of the number and distribution of the glycogen granules in the muscles, myocardium, liver, and kidney of 200 cadavers. The number of granules did not change during the first 12 hrs. after death, but decreased progressively thereafter. The number was greater in the spring and autumn than in summer and winter, was lower in children than in adults, and showed no sexual difference. Glycogen was most abundant in the gastrocnemius, less in the rectus abdominis, diaphragm and intercostal muscles, and least in the masseter muscles and those of the upper arm and fore arm. It was still present in the muscle in numerous diseases. JOSEPH S. HEPBURN

Man as a mechanical machine. C. OPPENHEIMER. *Naturwissenschaften* 8, 64-72(1920); *Physiol. Abstracts* 5, 187-8.—A study of the energy exchanges in basal metabolism and in the working animal body, the sources of animal heat, muscular efficiency, and contraction. The working muscle is not a heat engine but a chemo-dynamic machine which works isothermally to a certain extent. JOSEPH S. HEPBURN

Researches on the coagulation of the blood. Coagulation of fibrinogen without formation of additional thrombin. J. BORDET. *Réunion soc. belge biol.* 1920, 299-300; *Physiol. Abstracts* 5, 179.—Thrombin is the cause and not a product of the coagulation of fibrinogen, as may be shown by the following expt. A prepn. (A) of normal oxalated plasma rich in proserozyme but free from cytozyme is obtained by prolonged centrifugation. A prepn. (B) of the same plasma free from proserozyme is obtained by preliminary treatment with $\text{Ca}_3(\text{PO}_4)_2$ followed by centrifugation. Serum (C) contains thrombin. To A and B are added a small vol. of physiol. saline containing the Ca ion, and a small vol. of serum; C is diluted with the physiol. saline until the concn. of serum is the same as in A and B. Complete coagulation of A occurs in 45 min., while B slowly coagulates in several hrs. Liquids *a* and *b* exude from the clots in A and B. To both *a* and *b* is added a mixt. of cytozyme and plasma B to which the Ca ion has been restored. This mixt. is also added to C to form the liquid *c*. Coagulation then occurs in *b* and *c* in 90 min. and in *a*, on account of its high serozyme content, in 10 min.; *b* does not coagulate more rapidly than *c* which is a simple diln. of the original serozyme-containing serum in an inert medium. Therefore no additional serozyme was formed in *b*, for *b* required at least as much time as *c* to coagulate on addition of cytozyme. Hence coagulated fibrin is inert; and coagulation does not augment the factors which produce that phenomenon. JOSEPH S. HEPBURN

Researches on the coagulation of the blood. Properties of so-called pure solutions of fibrinogen. J. BORDET. *Réunion soc. belge biol.* 1920, 576-8; *Physiol. Abstracts* 5, 178-9.—Fibrinogen, which has been pptd. from oxalated plasma by addition of sufficient NaCl, and has been purified by the process of soln. and pptn. repeated several times, yields solns. which have a marked tendency to become cloudy or to coagulate spontaneously on keeping for some time. These solns. may be rendered far more stable by subjecting the oxalated plasma to a preliminary treatment with approx. one-tenth its vol. of a thick emulsion of $\text{Ca}_3(\text{PO}_4)_2$ for several hrs., followed by centrifugation to remove the insol. matter. The soln. then merely begins to become turbid at the end of a week, and its stability is further increased by addition of a small amt. of NaHCO_3 . The substance, which favors the spontaneous sepn. of the purified fibrinogen and is adsorbed by the $\text{Ca}_3(\text{PO}_4)_2$, apparently is neither thrombin nor its components cytozyme and proserozyme, but rather is either the debris of the blood platelets or an amorphous ppt. which accompanies them in their sedimentation. JOSEPH S. HEPBURN

Phosphorus and ash content of the human thymus. E. ZUNZ. *Réunion soc.*

beige biol. 1920, 647-8; *Physiol. Abstracts* 5, 191.—Analyses were made of the thymus obtained from 44 men (age 19 to 34 years) killed in the war. The gland was first extd. with Et_2O . The P ranged from 0.03 g. to 0.31 g., av. 0.1 g., or from 2.62 to 4.50%, av. 3.57%, of the dry thymus. The ash content ranged from 3.59 to 8.69%, av. 6.7%, of the dry gland. The ratio N:P was 2.80 to 6.61, av. 4.01. The % of ether ext. tended to increase with the age of the subject. This age relationship did not exist for total solids (20.49%), total N (13.65% of the dry residue), P, and ash; the chem. compn. of the gland did not vary with the age of the normal adult. Each g. of fresh thymus with its fat contained from 0.62 mg. to 1.61 mg., av. 1.09 mg., of lipin P; if this lipin P exists only in the thymus proper, its amt. would then range from 0.80 mg. to 1.82 mg., av. 1.32 mg.; these values are intermediate between those for the liver and the kidney. In the adults studied, the entire thymus contained from 5.5 mg. to 39.59 mg., av. 17.47 mg., of lipin P.

JOSEPH S. HEPBURN

Cholesterol and fatty acid content of the brain. T. MAGAYANIA. *Tokyo Igakwai Zasshi* 22, No. 8; *Sei I Kwai Med. J.* 37, No. 9(1918); *Jap. Med. Literature* 6, 20(1921).—Dried powdered *ox brain* contained 10.4% cholesterol. The substances sol. in warm petroleum ether amounted to 44.4%, and were equally divided between fatty acids and unsaponifiable matter.

JOSEPH S. HEPBURN

Stimulation and paralysis by heat and adaptation to the paralysis. W. THÖRNER. *Z. allgem. Physiol.* 18, 226-76(1919); *Physiol. Abstracts* 5, 122.—As the temp. gradually rises, a nerve shows first increased irritability, then decreased irritability, finally death. The limits of temp. for each effect vary with the animal and the nerve. Thus with the motor nerve of *Rana fusca*, irritability increases between 31° and 33°, and decreases between 33° and 36°. The decreased activity is attributed to lack of O. Adaptation to the paralyzing action may occur to a certain extent in either air or O; after recovery from the first exposure, a higher temp. is required in the second exposure to produce the same decrease in irritability.

JOSEPH S. HEPBURN

Mechanism of asphyxia and recovery in medullated nerves of cold-blooded animals. A. GORTSCHALK. *Z. allgem. Physiol.* 18, 341-70(1920); *Physiol. Abstracts* 5, 121-2.—Partial recovery of an asphyxiated nerve is produced by washing in an O₂-free isotonic NaCl soln. The recovery is more complete if administration of O₂ be followed by washing in the NaCl soln., than if only O₂ be given. Full recovery occurs on washing for 90 to 120 min. in an oxygenated NaCl soln. Recovery is due to oxidation of the asphyxial products, which renders them more diffusible and more readily removed from the nerve. Asphyxia of a nerve is due only indirectly to lack of O, the direct cause being accumulation of metabolites as a result of this lack of O. The energy developed by a nerve apparently is the result of an oxidative process, for a nerve retains its cond. for a long time in an atm. of N. The theory of a reserve of O, retained by the nerve in a potential state and not withdrawn in a medium free from O is considered untenable.

JOSEPH S. HEPBURN

Contributions to the biochemistry of iodine. IV. The effect of thyroxin on growth in white rats and in rabbits. A. T. CAMERON AND J. CARMICHAEL. *Univ. Manitoba J. Biol. Chem.* 46, 35-52(1921); cf. *C. A.* 15, 553.—It has previously been shown by C. and C. that decrease of total growth rate, hypertrophy of heart, liver, kidneys, and adrenals, and decrease of thyroid growth rate can be used as a rigid test for prepn. alleged to be the essential thyroid secretion. Thyroxin has been subjected to this test in the present expts. It produced the same qual. effects as desiccated thyroid but quantitatively its effect was distinctly less when compared on a basis of I content. This effect is probably due to decompn. of the thyroxin by intestinal bacteria; thyroid protein undergoing normal digestion may act in a protective capacity, the thyroxin liberated being absorbed as fast as it is set free. This result suggests that thyro-in can be controlled best in clinical use by being administered by injection rather than by mouth. The

hypertrophy of the heart and lymphatic tissue resembled that observed in cases of hyperthyroidism. All the rats fed thyroxin appeared normal throughout the expts., there was no change in the appearance of the hairy coat and no condition resembling tetany in any instance. The results with rabbits were in general agreement with those obtained with rats but the number used was too few for stress to be laid on them. A. P. L.

The rate of nitrogen elimination. W. S. McELLROY AND H. O. POLLOCK. Univ. Pittsburgh School of Med. *J. Biol. Chem.* **46**, 475-81 (1921).—Dogs were fasted for 24 hrs. and then fed weighed amts. of protein in the form of lean meat. The urine was obtained by catheterization at 2 hr. intervals and samples of blood were taken every hr. The N content of the urine and the amts. of non-protein N and urea in the blood were detd. The results indicate that the rate of N elimination is an index of the rate of digestion and absorption. A. P. LOTHROP

The regulation of the blood's alkalinity. I. H. W. DAVIES, J. B. S. HALDANE AND E. L. KENNAWAY. Oxford. *J. Physiol.* **54**, 32-45 (1920).—The complete CO_2 dissociation curve of human blood is given. It does not altogether agree with Parsons' theory at high CO_2 tensions. This curve cannot be altered in man by short periods of forced breathing or breathing moderate excess of CO_2 . It is greatly altered by the ingestion of NaHCO_3 . In the acidosis of breathing excess of CO_2 the urine becomes more acid and its NH_3 increases. In the alkalosis of forced breathing or NaHCO_3 ingestion it becomes alk.; the NH_3 decreases or disappears; and the rate of bicarbonate excretion may be very rapid. Acetone bodies generally appear in the urine of alkalosis. The alkalinity of urines containing NaHCO_3 was obtained by (1) adding excess 0.1 N H_2SO_4 , (2) aerating, (3) back titrating with 0.1 NaOH using neutral red as indicator. The excretion of alkali during forced breathing does not appear to be compatible with the theory that the kidneys reabsorb a fluid of const. composition from a glomerular filtrate. J. F. LYMAN

The acid-base equilibrium in the cerebrospinal fluid. T. R. PARSONS AND C. SHEARER. Cambridge. *J. Physiol.* **54**, 62-7 (1920).—Technic and app. are described for collecting cerebrospinal fluid without loss of CO_2 . The whole of the combined CO_2 of cerebrospinal fluid is in the form of NaHCO_3 . Cerebrospinal fluids are slightly more efficiently buffeted than NaHCO_3 solns., but not to an extent at all approaching that exhibited by blood. The CO_2 tension in the fluid in the body is considerably higher than that in normal arterial blood, and the reaction is distinctly less alk. J. F. L.

The partition of carbon dioxide between plasma and corpuscles in oxygenated and reduced blood. J. JOFFE AND E. P. FOULTON. Guy's Hospital. *J. Physiol.* **54**, 129-51 (1920).—As the pressure of CO_2 increases there is a steady migration of acid from the plasma into the corpuscles, so the dissociation curves of the plasma and the corresponding corpuscles are quite different from the dissociation curves of the sepd. plasma and sepd. corpuscles. On reduction of blood there is a migration of acid from corpuscles to plasma. Oxygenated hemoglobin is a stronger acid than is reduced hemoglobin. Reduced corpuscles and reduced true plasma contain respectively more CO_2 than oxygenated corpuscles and true plasma, the difference between the corpuscles being greater than the difference between the plasmas; so that if the venous blood were completely reduced, the transport of CO_2 would be carried out chiefly by the corpuscles. However, since venous blood is usually not more than 40% unsatd., the transport of CO_2 is carried out by corpuscles and plasma in nearly equal proportions. The method of Van Slyke and Cullen (*C. A.* **11**, 2207) for detg. alkali reserve of the blood is criticized. It is recommended that alk. reserve of the plasma be estd. by measuring the CO_2 content of the plasma sepd. from blood oxygenated at 40 mm. CO_2 . J. F. LYMAN

The relation of oxyhemoglobin to the carbon dioxide of the blood. J. M. H. CAMPBELL AND E. P. FOULTON. Guy's Hospital. *J. Physiol.* **54**, 152-66 (1920).—Throughout the range of p_{H} occurring in the body all the CO_2 is present as bicarbonate, and

the blood proteins act as acids combining with Na and competing for it with the CO_2 . The isoelec. point of hemoglobin has the value $p_H=6.98$. The acid dissociation const. of hemoglobin is 2.10^{-4} . At all pressures of CO_2 the p_H of the corpuscles is greater than the p_H of the plasma. The difference becomes less as the pressure rises. CO_2 is completely expelled from blood *in vacuo*, because the blood proteins, in their capacity as acids are present in sufficient concn. to combine with all the Na of the blood. The max. possible amt. of NaHCO_3 in blood (*i. e.*, total Na available for combining with CO_2) is 0.03 N.

J. F. LYMAN

The carbon dioxide-carrying power of the constituents of plasma. The alkali reserve of blood. J. MELLANBY AND C. J. THOMAS. St. Thomas's Hospital. *J. Physiol.* **54**, 178-91(1920).—M. and T. present evidence against the theory that hemoglobin or the proteins of the blood function as weak acids capable of sharing the available alkali of the blood with CO_2 . They believe (1) that the proteins of plasma adsorb CO_2 , which in the case of fibrinogen is relatively large in amt.; (2) that CO_2 is combined in blood in two ways (a) adsorbed by proteins and (b) as NaHCO_3 ; (3) that the transport of CO_2 is effected by the protein; (4) that the alkali reserve of blood is constituted by (a) NaHCO_3 and (b) protein.

J. F. LYMAN

Muscular contraction. I. The influence of temperature on the mechanical performance of skeletal and heart muscle. Y. DOI. Univ. College, London. *J. Physiol.* **54**, 218-26(1920).—So long as the muscle is under physiol. conditions with respect to its length, *viz.* if it is within the limit of the optimum, the power of mechanical performance is larger at a lower temp. than at a higher. The temp. coeff. of mechanical response is, therefore, negative. Under extreme conditions of overstretching this temp. coeff. may become positive.

J. F. LYMAN

Physical exertion, fitness and breathing. H. BRIGGS. Heriot-Watt College, Edinburgh. *J. Physiol.* **54**, 292-318(1920).—Physical work is found by experience to be easier to unfit men when oxygenated air (60% O_2) is breathed than when normal air is breathed, but no such difference is to be observed with fit men. On an overload, even the fittest man derives benefit from breathing enriched air. A method of measuring fitness is described: if curves be drawn showing work done (abscissae) and exhaled CO_2 percentage (ordinates), (a) when the subject breathes air, and (b) when he breathes O_2 , the curves are found to coincide up to the crest when the man is very fit and to diverge widely when he is unfit, since the CO_2 percentage becomes much lower in the unfit when only ordinary air is breathed.

J. F. LYMAN

Variations in alveolar carbon dioxide pressure in relation to meals. E. C. DONDS. Middlesex Hosp. *J. Physiol.* **54**, 342-8(1921).—After a meal a rise of from 2 to 8 mm. in CO_2 tension of the alveolar air was noted. Subsequently there is a fall of about the same amt. below the original level and finally a return to normal. In a man from whom the greater part of the stomach had been removed the rise after a meal was very small, while the subsequent changes were similar to those in a normal person. It seems that the rise is associated with the secretion of gastric juice, and the subsequent fall to the later processes of digestion.

J. F. LYMAN

A. Vicious activity of the gall bladder during biliary stasis. B. The determining factor in the causation of white stasis bile. P. ROUS AND P. D. McMASTERS. Rockefeller Inst. *Proc. Soc. Exptl. Biol. Med.* **17**, 159(1920).—Ligation expts. in dogs, cats, and monkeys show that under stasis conditions the gall bladder continues to function; it concentrates the bile and adds mucus to it. When obstruction is produced below the entrance of the cystic duct the extralobular biliary channels become filled with a thick, greenish black fluid. The ducts do not cause concn. nor addition of mucus. When the gall bladder is blocked off or not functioning during obstruction of the duct, a limpid, watery fluid collects, which is devoid of pigment and bile salts,—the "white

bile" of surgeons. These facts point to cholecystectomy as a wise measure in gall stone cases, notably when the gall bladder is little damaged. V. C. MYERS

The variable acidity of hemoglobin and the distribution of chlorides in the blood. F. C. McLEAN, H. A. MURRAY, JR., AND L. J. HENDERSON. Harvard Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 180-2(1920).—It is concluded from studies on fresh defibrinated ox blood that when the heterogeneous acid-base equil. is disturbed, the new equil. is established by migration of acids in and out of the cells, and that about $\frac{2}{3}$ of this acid is HCl. V. C. MYERS

Variations in the affinity of hemoglobin for carbon monoxide in health and disease. A. L. PRINCE. Yale Univ. School of Med. *Proc. Soc. Exptl. Biol. Med.* 17, 204-5(1920).—By a study of normal and diseased persons it was found that the CO variations in the O:CO affinity ratio of all bloods examined fall between 1:254 and 1:378, and these variations bear no relation to the hemoglobin % of the blood nor to the age and condition of the subject. V. C. MYERS

The elimination of carbon monoxide and a method of acceleration. H. W. HAGGARD. Yale Univ. Med. School. *Proc. Soc. Exptl. Biol. Med.* 17, 205-6(1920).—A study was made of the normal rate of elimination of CO in dogs gassed to 60 to 80% satn. of the hemoglobin. If the animals survived, the blood was practically free of CO in 2 to 3 hrs. At the end of 1 hr. there was generally a drop of only 10 to 20% in the hemoglobin satn. When dogs were allowed to inhale O the rapidity of elimination was doubled, though deaths from respiratory failure still occurred. Inhalations of 6% CO₂ in air increased the pulmonary ventilation and accelerated the period of elimination to $\frac{1}{2}$ or less of the normal. Inhalations of O containing 6% CO₂ resulted in complete elimination of the CO from the blood in 15 to 20 min. V. C. MYERS

The influence of oxygen in expelling carbon dioxide from the blood. Y. HENDERSON AND H. W. HAGGARD. Yale Univ. Med. School. *Proc. Soc. Exptl. Biol. Med.* 17, 206-7(1920).—A study was made on the influence of variations in O tension upon CO₂ capacity of blood. Defibrinated blood when equilibrated with air plus 5.6% CO₂ shows 53.5 vol. % CO₂, and with N plus 5.6% CO₂ it shows 58.5 vol. % of CO₂; oxalated blood shows no such effect of different O tension. V. C. MYERS

Osmosis as a factor in the local accumulation of leucocytes in the animal body. F. MALTANER AND E. N. HOPPE. N. Y. State Dept. Health, Albany. *Proc. Soc. Exptl. Biol. Med.* 17, 216(1920).—The forces active in producing chemotaxis of leucocytes are physical in character and are responsible for osmosis and diffusion. Leucocytes were shown to move in the direction of the osmotic force and opposite to the direction of the diffusing substances in solu. V. C. MYERS

Tracheal respiration. II. Gas diffusion in the trachea. AUGUST KROGH. *Arch. ges. Physiol. (Pflüger's)* 179, 95-112(1920).—The rate of diffusion into a tracheal system can be calcd. by the use of the formula: $S = k(p - p_1) a / l$, in which p and p_1 represent the O tensions at the two ends of the system, a is the area of a cross section of the tube, l is the length of the tube, and k is a const. which for O under the conditions of the expt. is about 0.18. The detns. observed experimentally in various insect larvae were compared with the theoretical results derived from this formula. In small larvae with closed tracheal systems the O consumption can be explained simply upon the basis of diffusion. In the larger larvae (*Cossus ligniperda*, etc.) active respiratory movements supplement the process of gas diffusion. III. Combination of mechanical ventilation and gas diffusion in *Dytiscus* larvae. *Ibid* 113-20.—The processes of respiration in insects are detd. in part by the anatomical structure of the tracheal system. In *Dytiscus* larvae $\frac{2}{3}$ of the system is thin walled and subject to respiratory movement, the remaining third is of more rigid construction anatomically and in this portion gas diffusion occurs. G. H. SMITH

Effect of thyroid upon tadpoles. A. JARISCH. *Arch. ges. Physiol. (Pflüger's)* 179, 150-

76(1920).—Expts. upon the feeding of thyroid tissue to tadpoles lead to the conclusion that the substance has no specific effect upon development, but is active only indirectly through the increased metabolism of the organism. G. H. SMITH

G—PATHOLOGY

H. GIDEON WELLS

The relation of the liver to the difference value of the blood. P. J. CAMMIDGE, J. A. CAIRNS FORSYTH AND H. A. H. HOWARD. London. *Lancet* 1921, I, 1017-20.—The "difference value" of the blood (cf. *C. A.* 14, 3457), estd. at hourly intervals before and after a test-meal, follows an abnormal course in conditions where the functions of the liver are interfered with. This "hepatic" curve differs markedly from the type of curve associated with pancreatic affections previously described, and bears no const. relation to the sugar content of the blood. The increase in the difference value of the blood following a meal in disease of the liver is chiefly due to hydrolyzable carbohydrate, probably of a dextrin-like nature, absorbed from the alimentary tract, which is permitted to pass through the liver into the peripheral circulation instead of being retained as it is normally. Dextrin-like substances derived from the glycogen stores of the liver may be a contributory factor in the production of the raised difference value under certain circumstances. Destructive changes in the hepatic parenchyma are associated with a diminution in the amylolytic enzyme content of the blood, thus tending to confirm the conclusion that the liver is the main source of that enzyme. E. B. FINK

Some observations on the urea concentration tests in the psychoses. J. WALKER. *Lancet* 1921, I, 1126-9.—In all, 83 cases were examd.: Mania, 13; general paresis, 3; insanity with epilepsy, 7; melancholia, 22; dementia precox, 22; confused state, 16. The urea concn. in the blood of these cases was considered an unreliable guide to the functional capacity of the kidneys because of wide variations. The urea concn. in the urine was found to give more reliable information. A low concn. should be regarded only as a confirmation of other evidence. Anomalous results, both as regards urea concn. in blood and urine, apart from kidney disease are commonly demonstrable in the psychoses. In dementia precox a low concn. of urea in the urine is found to coexist with polyuria and a state of acidosis. E. B. FINK

The filterability of anaphylatoxin through bacterial filters. E. FRIEDBERGER AND P. KONITZER. Grieswald. *Z. Immunität.* 31, 293-300(1921).—In a series of expts. anaphylatoxin proved to be filterable. There was some variation with the nature of the filters and in the different phases of filtration in some of which filtration was more difficult, in some less difficult, but in no case were the anaphylatoxins held back. These expts. negative the conclusions of Moreschi and Golgi (cf. *C. A.* 8, 368) that anaphylatoxin is not filterable. They also speak against the theory that anaphylaxis is produced by corpuscular elements which do not pass through filters (Schmidt, Schmidt and Schürmann), since on several occasions when *B. prodigiosus* passed through there was an unusually marked diminution of toxicity. E. B. FINK

The relation of globulins to the Wassermann reaction, with a note on the technique of dialysis and Wassermann reaction. G. KAPSENBERG. Groningen. *Z. Immunität.* 31, 301-71(1921).—In a positive serum it is the globulin which is responsible for the reaction, while the albumin reacts entirely negatively. The intensity of the Wassermann reaction produced by the serum and by its isolated globulins is the same. The globulin of a negative serum is in general negative. Occasionally it gives a positive reaction of varying strength. The explanation for this is not clear. It is probable that in such cases the globulin possessed this property in the organism and that the same influences which reinforce the globulin in a positive serum also influence the behavior of the "negative" globulin. There exist external influences, probably microörganismal, which may produce a strongly anticomplementary globulin and which can transform a "nega-

tive" globulin into a more or less "positive" globulin. The albumin of a negative serum always reacts negatively even when the globulin becomes positive through external influences. Theoretically, it is believed that the globulin adsorbs some hypothetical substance which had previously been free in the serum and which easily becomes adsorbed by a body of large surface. It is assumed that adsorption occurs at the moment when the globulin ppts. Also in *Ann. Inst. Pasteur* 35, 338-62(1921). E. B. FINK

The antagonistic influence of antigens upon anaphylaxis. WILHELM BRACK. Basel. *Z. Immunität.* 31, 407-31(1921).—Anaphylaxis expts. on guinea pig intestine strips gave the following results: Guinea pigs may easily be rendered anaphylactic with 3 different sera. In general, the reaction is most marked with the antigen first used for sensitization. There exists a definite quant. difference between sp. antianaphylaxis and non-sp. antianaphylaxis. The injection of a heterologous serum can produce anaphylactic shock in highly sensitized animals. This non-sp. shock is markedly slighter than the sp. Non-sp. shock may reduce the ability of an animal to react to homologous serum. Repeated injections of large doses of the same serum are followed by only very slight sensitization (development of immunity). E. B. FINK

The use of cholesterolized beef heart extract in the serodiagnosis of human syphilis. I. The influence of the addition of cholesterol upon the outcome of the Wassermann reaction. FR. GREATZ. Hamburg. *Z. Immunität.* 31, 431-54(1921).—The use of cholesterolized antigens enhances the sensitivity of the Wassermann reaction and renders the reaction less sensitive to temp. changes. E. B. FINK

The internal secretion of Sandströms glands. Parathyroid hypofunction and eclampsia. A. C. MASSAGLIA. *Endocrinology* 5, 309-31(1921).—A report of a series of expts. on dogs which led M. to the opinion that since the parathyroids appear to have the function of neutralizing or breaking down into waste products the catabolic products derived from pregnancy and the puerperium, a hypofunction of these glands may be a cause of eclampsia. F. S. HAMMETT

An important classification of albuminurias. E. G. BALLENGER and OMAR F. ELDER. *N. Y. Med. J.* 113, 686-7(1921).—When 1 dram doses of Na citrate are administered 3 times a day to patients with albuminuria there is made possible a classification of the subjects into 3 types: those who have no albumin and casts when the urine is kept alk.; those in whom there is a reduction in the amt. of albumin and casts; and those with no appreciable change following the administration of the alkali. The point is stressed that sufficient alkali must be given to render the urine alk. or neutral. F. S. HAMMETT

A human enterolith containing choleic acid. H. S. RAPER. Univ. of Leeds. *Biochem. J.* 15, 49-52(1921). BENJAMIN HARROW

Pleural exudates and transudates. K. NAGAHIMA. *Chu Gai Iji Shimpo* No. 911 (1918); *Jap. Med. Literature* 6, 7(1921).—Study was made of 40 pleural fluids of which 17.5% were bloody; the remainder were serous, and usually had a brownish yellow color. The sp. gr. of the fluids ranged from 1.017 to 1.023, and was 1.020 in one-half the specimens. The amt. of albumin ranged from 2.5% to 6%, and lay between 3.5% and 4% in 55% of the fluids; the amt. of albumin and the sp. gr. were not proportionate to each other. While all the fluids contained a relatively large proportion of lymphocytes, the type of cells present had no absolute value for the differential diagnosis of tubercular and non-tubercular cases. JOSEPH S. HEPBURN

Factors governing the inactivation of complement in hemolytic systems. A. Azzi. *Haematologica* (Napoli) 1, 126-40(1920); *Physiol. Abstracts* 5, 150(1920).—The complement in guinea pig serum is inactivated by prolonged energetic shaking, or by treatment with cobra venom or acids or alkalis, but may be reactivated by addition of serum which has been kept at a temp. of 54° for 20 min. Complement which has been rendered inactive by prolonged shaking is reactivated by serum whose com-

plement has been inactivated by cobra venom, acids, or alkalies. Complement which has been inactivated by cobra venom is not reactivated by serum whose complement has been inactivated by acids or alkalies. Complement which has been inactivated by acids is not reactivated by serum whose complement has been rendered inactive by alkalies. Since serum may be inactivated and reactivated by many factors and in many ways, the following conclusions are drawn. Inactivation is not due to the destruction of particular substances. Complement does not consist of one or more chemically definable compds. Complemental activity is due to a colloidal equil. which is easily altered by a great number of chem. or physical agents. Specific hemolysis is not due to enzyme action but is a physicochem. change produced by an alteration of a colloidal equil.

JOSEPH S. HEPBURN

Hydrophilic properties of cholesterolized lard. Experiment in vitro on the pathogenesis and therapeutics of irreducible edema. G. FONTÈS. *Monograph* 1919, 73 pp.; (*Imprimerie l' Abeille, Montpellier*); *Physiol. Abstracts* 5, 149.—The power of tissues to imbibe water depends on their content of cholesterol and fatty acids. A mixt. of cholesterol, lard, and artificial serum will absorb large amts. of water in the presence of NaHCO_3 , provided that the proper amt. of cholesterol be present in the mixt. The tissues act like this mixt. in the irreducible edema of some cases of nephritis. On theoretical grounds, this condition should be treated by agents which counteract the power to imbibe water, *i. e.*, by subcutaneous injections of olive oil followed by injections of H_2O , and accompanied by administration by mouth of capsules of essence of turpentine or eucalyptus.

JOSEPH S. HEPBURN

Alimentary arteriosclerosis in castrated animals. K. MURADA AND B. KATSAKA. *Nisshin Igaku* 7, No. 8(1918); *Jap. Med. Literature* 6, 13-4(1921).—This condition in castrated rabbits was apparently due to the hypercholesterolemia and the deposition of both neutral and doubly refractile fat in the walls of the vessels. J. S. H.

Comparative power of the plasma and the serum to agglutinate erythrocytes. V. WIDACOWICH AND S. DE MADRID. *Prensa Med. (Argentina)* 1920, No. 9, 283; *Physiol. Abstracts* 5, 126.—The agglutinating action of human serum on the erythrocytes cannot be used to decide if a transfusion is possible, for the agglutinating power of the serum and that of the plasma are very different, and frequently are not in harmony.

JOSEPH S. HEPBURN

Immunizing properties of fat-free tubercle bacillus vaccine. H. FURUYA AND I. KOTO. *Saikingaku Zasshi* No. 270, 200-10(1918); *Jap. Med. Literature* 6, 8(1921).—This vaccine, which had been rendered fat-free by extr. with alc. and Et_2O , possessed marked immunizing power. Protected animals merely developed local lesions when inoculated, while control animals developed generalized tuberculosis. J. S. H.

Studies of the frequency of albumosuria and of peptonuria. A. RICHAUD. *J. pharm. chim.* [7] 23, 376-83(1921).—Little is yet definitely known of the import of the presence of these substances in the urine. R. used the tests generally supposed to be capable of differentiating between them, and obtained results very different from those of van Noorden and Stockvis, who never observed peptones in urine. Some substances pptd. by phosphotungstic acid give only a faint cloudiness with tannin in acetic acid. Peptonuria not only exists but is frequent, for it was observed in 36 out of 71 pathological and in 3 out of 5 normal urines. It is noted especially in diseases due to lack of assimilation. Albumoses were present in only 4 of the 76 urines examd.; it was present once in pneumonia, twice in Pott's disease, and once in coxalgia. It is noted in diseases in which the primary lesion is the seat of intense suppuration, which suggests a relation between albumosuria and pathologic autolysis. It was, however, never observed in the cancer cases studied.

F. F. HEYROTH

The physical chemistry of filterable viruses. WALTHER FERRI. *Arch. wissen. u. prak. Tierheilkunde* 46, 103-39(1920).—No original data are given. An excellent

discussion is given of the following factors involved in the filtration of bacteria: Size and shape of bacteria, viscosity and surface tension of the soln., nature of filters, adsorption, pressure, and temp. From filtration data and from a theoretical basis F. reaches the conclusion that the nature of viruses must be cellular. G. E. HOLM

Hydrosalpinx. B. H. JÄGERROOS. Univ. Helsingfors. *Arch. Gynaekol.* 114, 328-392(1921).—The fluid in hydrosalpinx in most cases is clear and watery. It is occasionally colorless but is usually colored yellow to brown. In the 14 cases examd. the reaction was weakly alk. to litmus. The fluid is foamy and the sp. gr. varies from 1.006 to 1.022. An addition of AcOH at room temp. produces an opalescence but not a ppt. An addition of blood serum does not cause coagulation. Total protein content, serum albumin and serum globulin detns. were made according to a method previously published (*Arch. Gynaekol.* 91, 34(1910)). The total protein content varied from a trace to 6.75%. The relation between serum albumin and serum globulin, the protein quotient, varied considerably but was in general low. The character of the fluid as given, as well as the pathological and anatomical findings, support the conclusion that the fluid in hydrosalpinx is a transudate rather than an exudate. H. F. H.

Destruction of lactic acid in the lung. H. EPPINGER AND R. WAGNER. Vienna Medical Clinic. *Wiener Arch. inn. Med.* 1, 83-146(1920).—Since the lung has a greater reducing power than almost any other organ, a study was made of the metabolism of lactic acid during its passage through the lung. Physiol. salt soln. was introduced into the femoral vein of a dog and the dild. blood collected from the carotid. Artificial respiration was induced and then the animal was quickly killed. To the defibrinated blood was added a definite amt. of Na lactate. 1000-1200 cc. of the blood was perfused 30-35 times through the left lung, the remainder of the blood and the right lung serving as control. Lactic acid detns., made before and after perfusion, showed a loss in lactic acid of 47.3%. It seems probable, therefore, that lactic acid is altered during its passage through the lung. In comparison of the perfused lung with the other lung, the perfused lung showed a slight edema, but analysis of the two lungs showed too slight a retention of lactic acid in the perfused lung to account for the 47.3% loss of lactic acid previously noted. This expt. favors the standpoint that there is a change in the lactic acid as it passes through the lung rather than an adsorption. On addition of HCN, which paralyzes all vital processes, the lactic acid on perfusion through the lung suffers no loss; this indicates that the disappearance of the lactic acid is a cellular reaction. It was thought that hydroxybutyric acid might be converted to acetone and creatine to creatinine, but the results in the first instance were doubtful and in the second case negative. Other substances are to be tried. It is probable that the lung plays a role not only in the regulation of the gases of the blood but also in intermediate metabolism and that under physiol. conditions lactic acid is altered during its passage through the lung. HARRIET F. HOLMES

Wassermann reaction with the serum, urine and ascitic fluid of the same patient. J. KOSTRZEWSKI. *Centr. Bakt. Parasitenk. Abt. I.* 80, 451-5(1918).—The urine in a patient with a positive Wassermann serum was positive. The ascitic fluid was negative. JULIAN H. LEWIS

Deterioration of typhoid vaccine. G. W. MCCOY AND IDA A. BENGSTON. U. S. Pub. Health Service. *Hyg. Lab. Bull.* No. 122, 7-12(1920).—Typhoid vaccines kept at 5°, 10-12°, 20-30°, and 37° were tested at various intervals over a period of 2½ yrs. to study the rate of deterioration and the effect of temp. thereon. The results obtained indicate that the rapidity of deterioration is in direct proportion to the temp. above 15°. The vaccine at 5° apparently deteriorated more rapidly than the one stored at 10-15°, but the difference is probably not real. J. H. L.

Standardization of gas gangrene antitoxin. IDA A. BENGSTON. U. S. Pub. Health Service. *Hyg. Lab. Bull.* No. 122, 13-31(1920).—The antitoxins studied

were those for *B. perfringens* (Welchii), *Vibrio septique* and *B. oedematis*. The method of standardization was the same as for tetanus and diphtheria antitoxins. It is shown that the concn. of antitoxin in the antisera for gas-gangrene toxin is much lower than that in those for diphtheria and tetanus.

JULIAN H. LEWIS

Potency of bacterial vaccines suspended in oil (lipovaccines). IDA A. BENGSTON. U. S. Public Health Service. *Hyg. Lab. Bull.* No. 122, 33-42(1920).—Tests were carried out with certain oil vaccines for the purpose of establishing methods of standardizing the potency testing of these products. The preliminary work is here reported, but it is stated that not yet sufficient data have been obtained to justify the establishing of any definite standard or method of testing. In the case of the typhoid-paratyphoid oil vaccines the adaptation of the Hygienic Laboratory method of testing saline vaccines on rabbits for the production of agglutinins did not give results which compared favorably with those of saline vaccines, as far as carried out. Pneumococcus oil and saline vaccines were tested on mice and rabbits. A few tests with the oil vaccine on human subjects were also made. The results obtained in the case of rabbits and mice indicate that though both afford a certain amt. of protection, the saline vaccine was rather more effective in these animals. Protection tests made with immune sera from human subjects showed somewhat more favorable results than corresponding tests carried out with immune sera from rabbits, though testing on human subjects is not always a practical method for testing products. The results of these tests which were performed solely as a study in standardization should not be interpreted as having any necessary bearing on the prophylactic use of oil vaccines to prevent infection in man.

J. H. L.

The effect of freezing and thawing upon the antibody content of antimeningococcus serum. C. T. BUTTERFIELD. U. S. Pub. Health Service. *Hyg. Lab. Bull.* 124, 88-9(1920).—It was thought likely that antimeningococcus serum used for diagnostic purposes might be improved by freezing and thawing it. This throws down the fibrin, which, if not removed, sometimes causes nonsp. reactions in agglutination tests. However, freezing and thawing, either rapidly or slowly has no effect on its antibody content.

JULIAN H. LEWIS

The effect of body cells and fluids on certain dyes. T. D. BECHWITH. Univ. Cal. *J. Infect. Dis.* 27, 170-3(1921).—The dyes studied, when brought in contact with serum, bile and brain, were changed very little. On the other hand they were greatly affected by certain secreting and filtering tissues, such as liver, kidney, bone marrow and spleen. Lung and muscle occupied an intermediate position. Certain dyes, as acriflavine and proflavine, showed no change throughout. Other stains varied in outcome according to the particular cell structure with which they were placed in contact. Some dyes were reduced to the leuco base as methylene blue many times and as trypan blue once. Dyes are removed from the circulation through the agency of cell structures. Tissue cells rather than blood corpuscles are instrumental in this respect since neither serum, washed corpuscles, defibrinated blood nor blood treated with sodium oxalate is as active as a decolorizing agent *in vitro*. The particular tissue instrumental in this removal varies with the dye in question. Separation of the dye from its soln. in the serum is brought about by adsorption on cell surface with no vital staining evident at concns. used. Stains thus removed by adsorption are destroyed. This mol. destruction of the dye continues to the production of the leuco base in a few instances only, while in a great majority it extends to the formation of products further removed from the original chem. structure.

JULIAN H. LEWIS

Botulism from cheese. MARY NEVIN. N. Y. Dept. of Health. *J. Infect. Dis.* 28, 226-31(1921).—Three fatal cases presented the typical picture of botulism and *B. botulinus* was isolated from the cheese eaten. It is evident from these results that meat protein is not necessary to the growth and consequent toxin production of *B. botulinus*, and that cheese may serve as a medium. There is little significant variation in the

cultural characteristics from the type, but, contrary to the observations of van Ermen-
gen and others, *B. botulinus* grows luxuriantly and produces spores and toxin at 37°. The addition of peptone to the medium used is not necessary as in this work potent toxins were produced without the addition of peptone. A protective serum was produced in rabbits against the homologous toxin. It has been impossible, however, to test its antitoxic value with toxins from heterologous strains of the organism as the strains procured failed to produce toxin.

JULIAN H. LEWIS

The effect of mustard gas on antibody formation. LUDVIG HEKTOEN AND H. J. CORPER. Chicago. *J. Infect. Dis.* 28, 279-85(1920).—Mustard gas administered intravenously in amts. ranging from 0.005 to 0.0001 cc. a few days before or coincident with the intraperitoneal injection of sheep blood to rabbits (ranging from 3 to 4 kg. in wt.) had a restraining effect on the production of sp. lysin and precipitin in these animals as compared to controls given sheep blood alone. The lysin curve ran about the same course as that in normal rabbits, but the latent period of the precipitin curve was much longer than normal. Given several days after the introduction of the antigen there was still an appreciable effect of the mustard gas though less marked. The lysin produced by dogs, following the intraperitoneal injection of sheep blood, was also less after mustard gas had been given intravenously a week before or coincidently, than when given a week after the antigen administration. The agglutinin for rat blood corpuscles formed by dogs after the intravenous injection of rat blood was also lessened by the intravenous injection of mustard gas (0.5 cc., 0.1% per kg.) before or coincident with the injection of the antigen. Little, if any interference, with agglutinin production was noted if the mustard gas was given after the rat blood. Mustard gas profoundly modifies the leucocyte count of the blood in dogs as well as in rabbits and human beings. These expts. tend to place mustard gas in a class with the leucotoxic agents: benzene, the radioactive preps. of which Th X is an example, and the Roentgen ray, all of which, though probably differing in the details of their mechanism, have a profound effect on the hemopoietic organs, the leucocytes and sp. antibody formation.

J. H. L.

The effect of mustard gas on experimental tuberculosis. H. J. CORPER AND O. B. RENSCH. Denver, Colo. *J. Infect. Dis.* 28, 286-93(1920).—Mustard gas dissolved in 25% glycerol is bactericidal toward virulent human tubercle bacilli after an exposure *in vitro* of at least 1/2 hr. to 0.1% and after 2 hrs. to 0.01%. A virulent human and bovine tubercle bacilli seem to be slightly less sensitive, these organisms requiring an exposure of 4 hrs. to 1 day to obtain the same results. What part, if any, the hydrolysis of mustard gas in the glycerol played in this expt. was not detd. Mustard gas in 0.1% strength in 25% glycerol containing virulent human tubercle bacilli and injected immediately and subcutaneously into guinea pigs entirely prevented the development of systemic tuberculosis in these animals; even 0.01% mustard gas has a distinct retarding influence on the development of tuberculosis. This action could not be due to the tissue destructive action of the mustard gas in these concns., since the same results were obtained in the absence of ulcers. Mustard gas given subcutaneously to guinea pigs in amts. consistent with life (0.001 cc. in glycerol) in a single injection or repeated, at 4-day intervals for 3 or 4 injections, has no appreciable effect on the amt. of anatomic tuberculosis resulting from the subcutaneous injections of virulent human tubercle bacilli.

JULIAN H. LEWIS

Goiter produced experimentally with water in the province Salta. B. A. HOUSSEY. Buenos Aires. *Rev. inst. bact.* 2, 629-30(1920).—Goiter has been produced in rats in Buenos Aires by giving them H₂O to drink from Cerrillos (a northern town affected with endemic goiter).

JULIAN H. LEWIS

The preventive and curative action of normal horse serum in diphtheria. R. KRAUS AND A. SORDELLI. Buenos Aires. *Rev. inst. bact.* 2, 613-23(1920).—Normal horse serum contains diphtheria antitoxin. It has a protective and curative action

against exptl. infection and intoxication in rabbits, strictly proportional to its antitoxic value. In normal serum, as in the immune serum, the antitoxins are found in the pseudoglobulins. The albumins have no efficiency in this connection. JULIAN H. LEWIS

The use of birds (*Sycalis arvensis*) for testing dysentery toxin and antitoxin. A. SORDELLI. Buenos Aires. *Rev. inst. bact.* 2, 665-72(1920).—The testing of dysenteric serums and toxins is greatly improved by employing the small bird *Sycalis arvensis* on account of its great and constant sensitiveness to the toxin and because it reveals the slightest differences in the neutralizing power of the antiserum.

JULIAN H. LEWIS

A new method of preparing serum on a large scale. A. SORDELLI. Buenos Aires. *Rev. inst. bact.* 2, 673-8(1920).—Blood is collected in Na oxalate. The plasma is withdrawn in 48 hrs. and coagulated with CaCl_2 . The serum is rapidly filtered through a sterilized candle filter. The yield in serum is about 60% of the whole blood. The serum causes a lower proportion of serum disease.

JULIAN H. LEWIS

Normal antibodies in the blood. A. SORDELLI. Buenos Aires. *Rev. inst. bact.* 2, 679-88(1920).—The concn. of various normal antibodies in the blood goes parallel with the age of the animal.

JULIAN H. LEWIS

Testing of antisera with the complement-deviation test. PEDRO BELTRAMI AND J. M. GRASSI. Buenos Aires. *Rev. inst. bact.* 2, 689-700(1920).—The method of deviation of complement with normal or immune sera, using virulent cultures or vaccines as antigens, does not give satisfactory results as a test of the anti-infectious power of the sera.

JULIAN H. LEWIS

Immunological studies in meningo encephalitis of horses. R. KRAUS AND P. BELTRAMI. Buenos Aires. *Rev. inst. bact.* 2, 701-12(1920).—The antiserum prepd. with the meningococcus encephalitis exhibits properties of agglutination and complement deviation with its antigen. This organism can be identified with the antiserum when cultivated from the brain of a horse suspected to be dead of meningo encephalitis (Borna's disease). The antiserum alone and when mixed with the living organisms has a preventive action.

JULIAN H. LEWIS

The reaction of Sachs-Georgi. A. ARIAZZI AND C. E. PICO. Buenos Aires. *Rev. inst. bact.* 2, 721-7(1920).—Out of 408 serums tested, 390 or 95.4% gave identical results with the Wassermann and the Sachs-Georgi tests.

JULIAN H. LEWIS

The importance of the respiratory route in the production of antibodies. W. PFENNINGER. Zurich. *Ann. inst. Pasteur* 35, 237-60(1921).—Rabbits inoculated intratracheally with *B. paratyphosus* and *B. abortifaciens* produced agglutinins rapidly and in abundance. The concn. and persistence in the serum, of precipitins to horse serum, compares favorably with that following intravenous inoculation. Hemolysins and bacteriolysins are easily produced. Active immunity to *B. paratyphosus* and *sp. cholerae* may be produced and the protective power of the anti-cholera serum is high.

E. R. LONG

Studies on the resistance of red blood cells. I. Resistance of red blood cells in health to the hemolytic action of sapotoxin. CHAS. HUGH NEILSON AND HOMER WHEELON. St. Louis Univ. School of Med. *J. Lab. Clin. Med.* 6, 455-62(1921).—In samples of normal whole blood from 99 individuals the average maximum resistance to the hemolytic action of sapotoxin occurred in a 1:13,769 dilution of the toxin. In a 1:13,000 soln. the average length of time for complete hemolysis at 25° was 10.7 min. The limit of resistance of washed corpuscles in 12 cases was found to average a concn. of 1:37,375. Blood fluid around cells thus increases resistance toward hemolysis. Corpuscles from luetic blood were somewhat less resistant, and those in pregnancy and jaundice a trifle more resistant.

E. R. LONG

A test for early renal insufficiency. Preliminary paper. THOMAS BYRD MAGATH. Rochester, Minn. *J. Lab. Clin. Med.* 6, 463-8(1921).—Caffeine citrate caused a rise

in the uric acid value of the blood in nephritics, piling up in the blood either as uric acid or as some other substance giving a blue color with the Folin and Wu method. In general the test checked closely with the clinical findings.

E. R. LONG

The relation of histamine to leucocytosis. JOHN R. PAUL. Johns Hopkins Univ. *Bull. Johns Hopkins Hosp.* 32, 20-1(1921).—If histamine may be one of the protein poisons produced during an infection, its injection should give rise to systemic signs, such as fever and leucocytosis, which usually are seen in infections. The expts. were undertaken, therefore, to det. what influence histamine, introduced parenterally into rabbits, would have on the number of white blood cells in the blood stream, and what variations in temp. it would produce. Intravenous injections of single doses of histamine-HCl large enough to produce violent symptoms (1-1.5 mg. per kg.) and of smaller doses (0.25-0.5 mg. per kg.) at hourly intervals for 4-6 hrs. which produced only a transient dyspnea, were not accompanied by any material change in the number of white blood cells circulating in the blood stream. Subcutaneous administration of larger doses (14-16 mg. per kg.) were followed by a slight leucocytosis which came on about 2 hrs. after the injection and lasted from 5-6 hrs. after which the white blood cell count returned to normal. The rise was not dependent on the size of the dose and did not exceed physiological limits. Repeated subcutaneous injections over a period of 6 weeks did not cause a leucocytosis. Intraperitoneal injection of single doses (3-5 mg. per kg.) into guinea pigs caused a fall in temp. of 1-2° during the period of shock occurring immediately after the injection, but the temp. returned to normal within 1 hr.

A. P. LOTHROP

Certain chemical changes in the blood after pyloric obstruction in dogs. A. B. HASTINGS, C. D. MURRAY AND H. A. MURRAY, JR. Columbia Univ. *J. Biol. Chem.* 46, 233-32(1921).—The operation of closure of the pylorus was performed on 8 dogs by tying a stout string very tightly around the pylorus. A marked increase in the CO₂-combining power of the blood and a fall in the concn. of Cl ions were observed. "The explanation for the blood changes observed seems fairly clear. The alkalosis is evidently an exaggeration in duration and extent of the alk. tide occurring normally after meals. The formation and secretion of HCl by the cells of the gastric mucosa necessitate the removal from the blood stream of H and Cl ions. The former exist in the blood mostly as H₂CO₃, the latter in the form of NaCl. This process of selective secretion liberates HCO₃ and Na ions which unite to form NaHCO₃ and, in this fashion, bring about an increase in the alk. reserve." The HCl was removed as the animal washed out his own stomach many times a day by drinking H₂O and immediately vomiting it up. With one exception all the animals had twitches, fibrillations, spasms, and abnormal contractions of various kinds indicating hyperirritability. Possibly this hyperirritability is concerned with the equil. of certain electrolytes in the body, particularly the disturbance of the ratio between monovalent and divalent cations and anions. The most marked changes in the present series involve an increase in CO₂ and phosphate (divalent) ions and a diminution of Cl ions which should bring about hyperirritability. A very slight decrease in H-ion concn. occurred after the operation, but a rapid pre-mortem rise took place, just as in death from other causes.

A. P. LOTHROP

Observations on parathyroidectomized dogs. A. B. HASTINGS AND H. A. MURRAY. College of Physicians and Surgeons, Columbia Univ. *J. Biol. Chem.* 46, 233-56(1921).—The effects of parathyroidectomy upon the Ca, sugar, combined CO₂, and H-ion concns. of the blood were studied. The previously observed Ca deficiency was verified but no support was found for theories based on a disturbed acid-base equil. The Ca content decreased from the normal value of about 11 mg. per 100 cc. to about 5 mg. where it remained practically const. until death; tetany developed when the concn. reached approx. 7 mg. P and S were increased in the blood. The CO₂-combining capacity of the blood was slightly diminished for a short period following the operation and to a lesser

degree at the onset of acute tetany, but not the slightest evidence of a condition of alkalosis was obtained. The H-ion concn. remained relatively const., the av. of all detns. being 7.45, a value very close to that regarded as the reaction of normal blood. Post-operative hyperglucemia was observed, but otherwise there was no marked disturbance of glucose metabolism. Certain of the less obvious symptoms were carefully noted, and indicated an increased autonomic excitability paralleling similar changes in the voluntary nervous system and involving both the parasympathetic and sympathetic divisions, particularly the former. The results of the expts. have not led "to any clear conclusion as to the function of the parathyroid glands or the fundamental disturbances which follow their removal. It is not maintained that the disordered salt equil. (decrease in Ca, increase in PO_4 , etc.) is the underlying disturbance. Many signs seem to point to a fundamental disturbance in protein metabolism, even though evidence in favor of the accumulation of any one toxic protein decompn. product in the blood is as yet incomplete. An observation made in these expts. which suggests a relationship between muscular exercise and tetany may have some bearing on this phase of the question. On two sep. occasions attacks of tetany were brought on in a parathyroidectomized dog which, at the time, gave no evidence of hyperexcitability, and, in fact, seemed on the road to recovery, by running 1-2 hrs. on a treadmill. Further work on this subject should be devoted to studying the disordered protein metabolism and the connection between protein metabolites and salt equil."

A. P. LOTHROP

Studies with lecithin and cholesterol in relation to the antihemolytic property of human serum. HALLIE M. CLARK AND FRANK A. EVANS. Johns Hopkins Univ. and Hosp. *Bull. Johns Hopkins Hosp.* **32**, 113-21(1921).—The protective power of normal serum against hemolysis by Na oleate or saponin is not directly or wholly dependent upon either cholesterol or lecithin alone or to simple combinations of the two. When emulsified in NaCl soln. cholesterol protects against hemolysis by saponin but is ineffective if added in the cryst. condition or if serum is present. The diminution of the protective power of serum against hemolysis in hemolytic anemia cannot be explained on the basis of a diminution in the total cholesterol in the blood, and the results of the expts. do not permit one to suggest any possible relationship which cholesterol or lecithin may have to the hemolysis occurring in such anemias. A. P. LOTHROP

The activation of muscle catalase by liver. T. C. BURNETT. Univ. Calif. *Am. J. Physiol.* **56**, 16-21(1921).—The apparent acceleration of muscle catalase by liver seems to be due to the presence of catalase in liver, which in the presence of muscle acts under more favorable conditions of p_{H} , e. g. p_{H} of H_2O_2 was 2.4, muscle and H_2O_2 p_{H} was 4.5. Cf. *C. A.* **14**, 3253. J. F. LYMAN

The source of diastases of the blood. I. H. DAVIS AND E. L. ROSS. Northwestern Med. School. *Am. J. Physiol.* **56**, 22-8(1921).—Expts. on normal and depancreatized dogs lead D. and R. to conclude that the pancreas is practically the only source of blood diastases. J. F. LYMAN

Extensibility of muscle: The production of carbon dioxide by a muscle when it is made to support a weight. N. B. EDDY AND A. W. DOWNS. Univ. Alberta. *Am. J. Physiol.* **56**, 188-95(1921).—The isolated gastrocnemius muscle of the frog when extended by a wt. of 50 g. produces CO_2 at a faster rate (about 4 times as fast) than an unstretched muscle under otherwise similar conditions. J. F. LYMAN

The four phases of heat production in muscle. A. V. HILL AND W. HARTREE. Cambridge. *J. Physiol.* **54**, 84-128(1920).—App. and methods are described by which the heat production of a muscle can be recorded photographically, if necessary, to less than 0.000001°. At 0° the time relations of the heat production in the first few seconds after excitation of the frogs sartorius are independent of the presence of O_2 . The initial chem. breakdown following stimulation may be regarded as being entirely non-oxidative in character. In a prolonged contraction (e. g., 2 secs. tetanus) the heat

production may be resolved into 4 phases; (a) an initial rapid production, diminishing gradually in rate as the stimulus proceeds; (b) a smaller const. heat production maintained so long as the stimulus is maintained and ending shortly after stimulation ceases; (c) a relatively large evolution of heat occurring rather suddenly during the later stages of relaxation; and (d) a large, but slow, production of heat occurring in the presence of O_2 for some mins. after contraction is over. In a twitch evoked by a single shock only 3 of these phases occur, (a), (c) and (d). It is natural to associate (a) with the development, (b) with the maintenance, and (c) with the disappearance of the mechanical response, and to connect (d) with the process of recovery. The course of heat evolution in the fourth phase (recovery) was studied. At 20° heat production of recovery increases in rate for 30 to 40 secs. and then falls gradually to zero. It appears that the oxidative processes of recovery are complex, the initial stages involving non-oxidative reactions, the later stages involving oxidations. A close analogy to the energy relations of muscle and the 4 phases of its contraction is provided by those of an electromagnet excited by a current from an accumulator.

J. F. LYMAN

The metabolism of the salivary glands. I. The relation of the chorda tympani to the nitrogen metabolism of the submaxillary gland. G. V. ANREP. *J. Physiol.* 54, 319-31 (1921).—During secretion by the submaxillary gland, produced by stimulation of the chorda tympani, the N output is greater than the N loss of the gland. The % of mucin N in the secreted saliva gradually falls off and finally becomes zero. The % of non-mucin N remains practically const. The loss of N by the active gland is equal to the mucin N output. It may be concluded that the mucin of the saliva comes entirely from the mucin or mucinogen preformed in the gland, that the non-mucin N is derived from the body fluids and that no formation of mucin or increase of N cell substance takes place during chorda stimulation.

J. F. LYMAN

New methods for the analysis of cytoplasmic structures. R. H. BOWEN. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 57-9 (1919).—A modification of the Kopsch method for Golgi bodies is described. It depends on the reduction of osmic acid by the Golgi app. more quickly than by other cell constituents. Fix in glass-stoppered bottles for 20 to 30 hrs. in Mann's sublimate-osmic containing 1 part of 1% osmic acid soln. and 1 part corrosive sublimate, satd. soln. in normal salt. Wash in H₂O overnight, dehydrate and embed. Cut sections 4 micra thick. Mount directly or counterstain; Golgi elements are intense black, mitochondria unstained or light brown. Mitochondria are considered as a combination of some lipid with an albumin. With Cajal's Golgi-app. method it is possible to demonstrate a compd. structure, the medullary substance impregnating intensely, while the chromophilic envelope remains transparent.

V. C. MYERS

Calcium in the blood in diseases of the skin. W. C. THRO AND MARIE EHN. Cornell Univ. Med. Coll. *Proc. Soc. Exptl. Biol. Med.* 17, 115-18 (1920).—Preliminary to studying the value of Ca in the treatment of furunculosis, detns. of the amt. of Ca in the blood of patients were made. It was found that in most of the patients with acne the amt. of Ca in the blood was markedly increased, while in some of the patients with boils the Ca was very low. A gravimetric ashing method was used on citrated blood which gave somewhat higher results than the titration method of Halverson and Bergeim. A diet low in carbohydrate was tried on 2 patients with acne, resulting in the lowering of the Ca in the blood. The blood of 1 diabetic was tested for the Ca content but the amt. was not decreased. In 1 patient with folliculitis barbae, in which the hair follicle is involved, the amt. of Ca in the blood was increased. Calcium in the blood. *Ibid* 18, 189-91 (1921).—The high values for Ca in blood found by the gravimetric method used in previous work were found to be due to Ca in some of the filter paper used. The titration method of Halverson and Bergeim has been used for the series here reported. In 7 normal persons there were 7.8 to 9.8 mg. Ca per 100 cc. blood

plasma. Considerable variation in the values for diabetics was found, but with most of them the amts. were normal or below normal and very few were above normal. The Ca content of the blood was high in patients with severe acne who had not been treated, but there were great variations in the amts. of Ca in the blood of acne patients. Four patients with furunculosis had reduced amts. of Ca in the blood. Detns. of Ca in several conditions showed low values for hemophilia and puerpura hemorrhagia, values similar to normal for hemiplegia, secondary anemia, pneumonia and familial paralysis, and higher values for some of the cases of nephritis and for healed pulmonary tuberculosis.

V. C. MYERS

The relation between the disappearance of foreign proteins from the circulation and the formation of antibodies. W. T. LONGCOPE AND G. M. MACKENZIE. Presbyterial Hosp., N. Y. City. *Proc. Soc. Exptl. Biol. Med.* 17, 133-6(1920).—The object of this investigation was to det. whether the presence of antigen, namely, horse serum, bears any relation to serum disease or to the production of antibodies. By the method of specific pptn. a reaction for horse serum may be obtained in the blood, both of animals and of human beings, for many days after the injection of horse serum. Since reactions for horse serum cannot be obtained in the urine, it is improbable that horse serum is secreted as such by the kidneys. By studies made on rabbits and on 14 human beings it was found that in 1 group of individuals the reaction for horse serum disappeared fairly promptly from the blood of individuals who had severe serum disease and who formed precipitins towards horse serum, and that the disappearance of the antigens, that is the horse serum, came shortly after the subsidence of the serum disease, and when the precipitins were present in the largest concns. In the 2nd group the reaction for horse serum persisted in the blood over long periods of time. In these patients the precipitin reaction was absent or slight and serum disease was absent or of very mild type. It is known that individuals vary within very wide limits in their reactions to injections of foreign proteins. These observations suggest that those individuals who are relatively insusceptible have some protective mechanism either in the serum or in the cells of the body which prevents or delays the union of the antigen with the cells of the body.

V. C. MYERS

Coli fever and blood volume in dogs. H. G. BARBOUR AND A. J. HOWARD. Yale Univ. School of Med. *Proc. Soc. Exptl. Biol. Med.* 17, 148-50(1920).—Injections of peptone into dogs gave a temp. increase of about 1° with a return to normal within 2 or 3 hrs. Injections of killed cultures of colon bacilli caused increases up to 2.4° above normal by the 2nd or 3rd hr., with a very slow return to normal on the 2nd day. Changes in the blood vol. of coli fever dogs were followed by hourly detns. of hemoglobin and blood solids. The blood solids showed an increase running parallel with the increase of body temp. varying at the max. point from 3.3 to 7.6% in 5 different animals. Similar hemoglobin changes were quite definite in some cases. This points to a decrease in blood vol. due to loss of H_2O . No significant increases have been noted in the amt. of urine.

V. C. MYERS

Preparation and refining of diphtheria toxin-antitoxin. E. J. BANZHAF. Dept. of Health, N. Y. *Proc. Soc. Exptl. Biol. Med.* 17, 151-5(1920).—Diphtheria toxin-antitoxin is adjusted by adding to each L⁺ dose 1 unit of a properly aged antitoxin and storing for 6 weeks in a refrigerator for stabilizing. Five mls. injected into a guinea pig cause death from late paralysis after 20 to 25 days. This retains its balance at least 8 mos. and its immunizing value at least a year.

V. C. MYERS

Disturbances in the development of mammalian embryos caused by radium emanation. J. F. GUDERNATSCH AND H. J. BAGG. Cornell Univ. Med. Coll. *Proc. Soc. Exptl. Biol. Med.* 17, 183-7(1920).—The injection, subcutaneously or intravenously, of radium emanation into pregnant rats produced hemorrhagic areas in the uteri and ovaries. Some embryos were killed in the uterus and remained attached to the uterine

wall and were gradually absorbed. In other cases the fetuses were not killed, but peculiar macroscopic lesions appeared in their skin vessels, producing hemorrhagic areas along the dorsal midline, or in some cases over the entire body with the exception of the ventral surface. In some instances when the fetuses were carried to full term, hemorrhagic areas were noted at birth or these areas appeared in several days after birth.

V. C. MYERS

The purification and concentration of antigens by new methods of adsorption. A. B. WADSWORTH AND F. MALTANER. N. Y. State Dept. Health, Albany. *Proc. Soc. Exptl. Biol. Med.* 17, 189-90 (1920).—Antigens used for complement fixation in tuberculosis were prepd. from cultures by the common methods of fractioning and extn.; they were found to be so anticomplementary as to be useless. By dialysis of the culture filtrates this anticomplementary action was eliminated. Animal charcoal adsorbed the antigenic substances, but they could not be recovered by extn. of the charcoal. Adsorption with globulin was more successful. The dialyzed antigen was mixed with 1 part horse serum to 20 of antigen and allowed to stand in the incubator $\frac{1}{2}$ hr. The globulin was pptd. by passing CO_2 gas (free from HCl) through the mixture for $\frac{1}{2}$ hr. at 37° . By shaking the globulin ppt. with alc. the antigenic substances were extd.; this alc. ext. was concd. in a vacuum. Antigens used in diagnosis of syphilis by complement fixation were also purified and concd. by similar methods. V. C. MYERS

Observations on the immunization of rabbits with single-strain and combined multiple-strain vaccines. W. C. NOBLE, JR. AND R. A. THOMAS. N. Y. Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 190-2 (1920).—A study was made of the relative amts. of bacteriolysins produced on immunizing rabbits with single-strain vaccines of typhoid, paratyphoid A and paratyphoid B, and with combined triple vaccine of the three strains. The degree of immunity reached for each organism would appear to be lower when the triple vaccine was used than with the single-strain vaccine. V. C. MYERS

Superficial tension and antianaphylaxis. W. KOPACZEWSKI. *Compt. rend.* 172, 936-9 (1921).—K. gives a review and criticism of A. Lumière's work (cf. C. A. 14, 3277; 15, 393, 1165, 2123).

L. W. RIGGS

Superficial tension and anaphylactic shock. AUGUSTE LUMIÈRE. *Compt. rend.* 172, 1071-2 (1921).—Reply to Kopaczewski (cf. preceding abstract). L. W. RIGGS

Gastric analysis. III. Examination of the abnormal gastric residuum. W. W. LERMANN, M. E. REHFUSS AND P. B. HAWK. *J. Am. Med. Assoc.* 76, 1340-2 (1921); cf. C. A. 15, 1549.—Conclusions: The examn. of the fasting stomach is in reality an examn. of the interdigestive period of gastric activity. The av. normal findings and the mean variations are a basis for the interpretation of pathologic variations. In this study, the significance and the analysis of increased quantity, food retention, altered acidity, pus, blood and mucus have been discussed in detail. The general grouping of pathologic findings as suggested here is a simple means of interpretation of these findings. The detn. of swallowed mucopus as an evidence of focal infection above the level of the cardia is one of the simplest and most satisfactory means for accurately detg. the presence of an open focal infection. The examn. of the residuum is vitally important, as it is likely to reveal the presence of pathologic exudates which are obscured by the food material during the digestive phase. L. W. RIGGS

Research on the blood. E. LIEBREICH. *Schweiz. med. Wochschr.* 51, 275 (1921); *J. Am. Med. Assoc.* 76, 1373.—L. announces that all factors which prevent coagulation prevent the appearance of eosinophil cells and of Charcot's crystals in the blood. Also that it is possible to cause large masses of eosinophil cells and Charcot crystals to appear in every specimen of extravasated blood, regardless of the previous proportions of eosinophils in the blood. His research has shown further, that the eosinophil granules are the crystals of a substance which, when conditions are particularly favorable, crystallizes in the form we know as Charcot's crystals. Eosinophilia is the result of an overpro-

duction of this eosinophil secretion and of its solvent, both of which participate in coagulation outside of the body. Eosinophilia may be the expression of some phenomenon of colloidoclasia as Widal uses the term. Charcot's crystals can be shown in any blood by removing the plasma and allowing the drop of blood to coagulate between slides. Among the facts which these assumptions explain is the sudden appearance of eosinophilia, as may occur in asthma. Also the local and general eosinophilia which may accompany considerable extravasation of blood that does not coagulate. Also the abundance of eosinophils and Charcot's crystals in myelogenous leucemia with its slow coagulation of blood.

L. W. RIGGS

Auto-urine test for active tuberculosis. COLE B. GIBSON AND WM. E. CARROLL. Meriden, Conn. *J. Am. Med. Assoc.* 76, 1381-4(1921).—The theory upon which this test is based is that when there is an active tuberculous process in the body there must be products of elimination and disintegration of and due to tubercle bacilli. "The presence of these products or antigens is proved by the auto-urine reaction, depending however, on allergy or org. hypersusceptibility of the skin." The demonstration of the presence or absence of antigens is accomplished by injecting into the skin of the urinator his own urine, which has undergone certain modifications. Technic with full details is given with results from 40 cases. Because of the small number of cases the authors do not care to draw conclusions but refer to the work of Wildbolz, cf. C. A. 14, 2949, and quote the following from Lanz, *Schweiz. med. Wochschr.* April 22, 1920: In all clinically positive cases of tuberculosis, both auto-serum and auto-urine reactions give positive results. In all nontuberculous cases both reactions are negative. If the reaction is positive, contrary to expectation, there is positively an undemonstrable but still active tuberculous process in the body. These conclusions are based on tests of more than 300 cases.

L. W. RIGGS

Hemolysis and alterations in the colloids of the blood corpuscles. I. Hemolysis and heat precipitation at various hydrogen-ion concentrations. A. JODLBAUER AND F. HÄFFNER. *Arch. ges. Physiol. (Pflüger's)* 179, 121-33(1920).—The relationships between the process of hemolysis and changes in the state of the colloids of the blood corpuscles are demonstrated by a study of the effects of heat, neutral salts, narcotics, and hypotonicity upon these processes. The expts. were performed with 1% erythrocyte suspensions in physiol. saline buffered with phosphate mixts. and rendered of the desired p_H with HCl or NaOH. Hemolysis and pptn. of stroma colloids were observed in these solns. under different degrees of temp. At p_H 7 hemolysis occurred at 50°; as the p_H was changed toward either the acid or the alk. side the temp. at which hemolysis took place progressively decreased, although in the alk. range the cells presented a somewhat higher resistance than on the acid side. Only upon the acid side was aggregation of stroma colloids noted at temps. as low as 40°, and here in the same acidity as induced hemolysis. Aggregation also occurred on the alk. side (optimum p_H 9.5) at temps. as high as 56°. The two pptn. optima are at about p_H 3 and p_H 9.5, with the minimum at or near the neutral point. The complexes which ppt. at the alk. optimum are sol. in warm dil. alc., those which form on the acid side are not. When both lysis and aggregation occur the first process takes precedence, and the close relationship between lysis and pptn. at various temps. and under different p_H concns. suggests that heat hemolysis may well be a colloidal process. II. Effect of sodium, potassium and calcium upon heat hemolysis. *Ibid* 134-9.—Heat hemolysis of red cells takes place within the p_H range 8.5 to 4.5 more readily in the presence of K than of Na. Below p_H 4.4 Na is the more active. Between p_H 11.5 and 4.4 hemolysis is more marked in the presence of Ca than of Na. Ca inhibits heat hemolysis below p_H 4.4. The pptn. optima of the stroma colloids in the presence of either Na or Ca are at p_H 4.4 and 8.9. It is concluded that salt-ion hemolysis is a process of colloidal nature. The lytic expts. were conducted at temps. of 54-56° in solns. buffered with glycocoll, and those on pptn. with 0.9% NaCl

at 63° and with 1.14% CaCl_2 at 54°. III. Hemolysis and precipitation by narcotics. F. HAFNER. *Ibid* 140-3.—Expts. upon the hemolysis of red cells and the pptn. of stroma colloids by alc. and urethan in solns. of various p_H values and at different temps. gave values which closely approximated those obtained in observing the effects of heat upon the same processes. IV. Hypotonic hemolysis. *Ibid* 144-8.—Hypotonicity was secured by employing decreasing concns. of NaCl in solns. of definite p_H values. The effect upon hemolysis indicated a max. resistance to hypotonic lysis at p_H 9.5. Resistance to hypotonic lysis by changes in the H-ion concn. is in a direction opposite to that induced by H ions upon the lytic processes associated with heat or alc.

G. H. S.

H—PHARMACOLOGY

ALFRED N. RICHARDS

Treatment of bilharziasis of the bladder. D. PETILLO. New York. *Surgery Gynecology and Obstetrics* 32, 287-90(1921).—Details of successful results following the use of Sb tartrate.

A. T. CAMERON

Carbon tetrachloride for the removal of parasitic worms, especially hookworms. M. C. HALL. Bur. Animal Ind., U. S. Dept. Agr. *J. Agr. Res.* 21, No. 2, 157-75(1921).—Expts. were performed on 30 dogs. The CCl_4 was administered in capsules at the rate of 0.3 cc. per kg. The CCl_4 was followed immediately by 30 cc. of castor oil. CCl_4 plus thymol and CCl_4 plus chenopodium oil were also used, the former combination giving poor and the latter excellent results. CHCl_3 and chenopodium oil were tested separately and combined with indifferent results. Ante mortem and post mortem conditions of the animals are described. CCl_4 is more effective against the hookworm than any of the other commonly used drugs. It is a cheap and safe drug. Only a pure and carefully refined CCl_4 should be used. CCl_4 although somewhat inferior to chenopodium oil is effective for removing ascarids. CCl_4 will remove whipworm as other anthelmintics do when it gets into the cecum. It is not of value against tapeworms.

F. C. COOK

The action of digitalis and atropine on the peripheral blood pressure. I. HARRIS. Liverpool. *Lancet* 1921, I, 1072-4.—Under the influence of digitalis the diastolic pressure becomes lower and incidentally the systolic, while pulse pressure rises. The decline of the diastolic pressure is not due to a diminished output of the heart; the contrary is the case. Neither is the low diastolic pressure due to dilatation of the arteries. The conclusion is that the blood stream leaves the arterial circulation at a faster rate than under normal conditions. The corollary to this is that under digitalis the heart contains at the beginning of the systole a greater amt. of blood than before. The quickening of the pulse observed in the latter stages of digitalis is due to the fact that the intracardiac pressure is sufficiently high to excite contraction in a shorter time than normal.

E. B. FINK

Iron and arsenic as influencing blood regeneration following hemorrhage. VI. Negative influence of familiar drugs on the curve of hemoglobin regeneration following hemorrhage. G. H. WHIPPLE AND F. S. ROBSCHT. Univ. Calif. Med. School. *Arch. Internal Med.* 27, 591-603(1921); cf. *C. A.* 14, 3712, 3713.—Hemoglobin regeneration following hemorrhage in dogs on a bread-milk diet was not influenced by the administration of Blaud's pills, of ferric citrate (subcutaneously) or of oxoferrin (orally). Somewhat more favorable results were obtained with a mixt. of salts (McCullum and Simmonds, *C. A.* 12, 286) or with hemoglobin (orally, intraperitoneally or intravenously). As in the form of Na cacodylate or of Fowler's soln. was also inactive. A meat diet caused the most rapid regeneration but, apparently, this was due not to the Fe but to pyrrole or other factors.

I. GREENWALD

Dermatitis and allied reactions following the arsenical treatment of syphilis.

JOSEPH EARLE MOORE AND ALBERT KHIDEL. Johns Hopkins Hosp. *Arch. Internal Med.* 27, 716-47(1921).—Discussion of dermatitis and allied reactions observed in 23 patients treated with a number of As preps. I. GREENWALD

Antidotes for cocaine poisoning in animals. AGDA HOFVENDAHL. *Biochem. Z.* 117, 55-66(1921).—H. gave pilocarpine to a patient suffering from acute cocaine poisoning and got a remarkable relief. He then tried the same antidote on cocaineized dogs but with negative results. Having observed in all of his poisoned animals that convulsions were a common symptom, H. tried as antidotes various substances which are supposed to diminish neural irritability and found that Na diethylbarbiturate, chloral hydrate, and scopolamine hydrobromide were effective in relieving the tetany and preventing death. These compds. act best when administered by methods yielding quick absorption. F. S. HAMMETT

Pharmacodynamic study of diethylbromoacetylurea comparing it with bromocaproylurea. M. TIFFENEAU AND ÉT. ARDELY. *Bull. sci. pharmacol.* 28, 241-9(1921).—The administration of 0.35 to 0.40 g. per kg. of diethylbromoacetylurea to dogs has an hypnotic action that is not shown by its isomer α -bromocaproylurea. When the compd. is given intraperitoneally in olive-oil soln., doses of 0.15 g. produce sleep while doses of 0.3 g. are fatal. The partition coeff. between H_2O and oil is 1.22. Detns. of the Br content of the blood after the administration of the drugs *per os* showed that the 2 compds. are absorbed at just about the same rate. Notwithstanding this, diethylbromoacetylurea apparently is taken up in slightly larger amts. by the brain substance, which is taken to indicate one of the reasons why it exhibits an hypnotic activity. A prolonged urinary excretion of the compd. was noted, demonstrating considerable retention. F. S. HAMMETT

Treatment by X-ray and radium. ROBERT KNOX. *Edinburgh Med. J.* 26, 273-93(1921).—Of medical interest. F. S. HAMMETT

Pharmacology of sen-so. KANJIRO KODAMA. *Acta Schol. Med. Univ. Imp. Kioto* 3, 299-319(1920).—Sen-so, which is used in Chinese medicine, has as its active ingredient the concd. secretion of the skin of the toad. It contains a compd. known as bufagin and a poison, producing convulsions, designated *bufotoxin*, having the compn. $C_8H_{10}O_5$, and crystg. in needles. By its action on the central nervous system, bufotoxin causes convulsions, increased respiration, vomiting, secretion by different glands especially the sweat glands, and vascular contraction; it apparently stimulates the cardiac vagus by central action; and it lowers the body temp. Other physiol. actions of bufotoxin are: The heart muscle is stimulated by a small dose, and first stimulated then paralyzed by a large dose. The musculature of the peripheral vessels undergoes a transient stimulation, followed by paralysis. The skeletal muscle is rendered less irritable; but the amplitude of the contraction is increased. The endings of the motor nerves are first stimulated, then paralyzed. The intestine is stimulated; and the tonus of the uterus is increased. When bufotoxin is applied to the mucous membrane, it produces a slight itching, then anesthesia in more dil. soln., and causes irritation in more concd. soln. Pharmacol. evidence was obtained that the bufotoxin of sen-so is derived from the secretion of the skin of the toad. JOSEPH S. HEPBURN

Influence of the aliphatic narcotics upon water-hemolysis. TADASHI YOSHITOMI. *Acta Schol. Med. Univ. Imp. Kioto* 3, 338-49(1920).—Water-hemolysis is that produced by hypotonic solns. The narcotics used were: Et_2O , $CHCl_3$, chlorotone, amylene hydrate, paraldehyde, chloral hydrate, urethan, $MeOH$, $EtOH$, $PrOH$. The indifferent aliphatic narcotics all hastened hemolysis, provided their solns. were sufficiently concd. The lipid layer of the erythrocytes was disintegrated. The hemolysis was due to the combined hemolytic action of the hypotonic soln. and the narcotic. Et_2O , $CHCl_3$, chlorotone, and amylene hydrate were able to retard hemolysis if used in the proper concn. This concn. usually lay directly below that which accelerated hemolysis.

and, at times, was coincident with the latter, so that hemolysis was first retarded, then accelerated. The retardation must depend upon the lipotropic properties of the compd. in question; either the cell membrane is condensed and rendered less permeable to the entrance of H_2O or else it is made sufficiently permeable to permit the escape of salt from the erythrocyte to the surrounding liquid. While a retarding action was never found for any of the other narcotics used, it must exist for all substances but is not always detected by the exptl. methods which are not sufficiently delicate for all cases.

JOSEPH S. HEPBURN

Pharmacological action of dehydromorphine. HIROSHI ŌSHIKA. *Acta Schol. Med. Univ. Imp. Kioto* 3, 377-90(1920).—On subcutaneous injection, dehydromorphine exerts a very slight and irregular action since it is absorbed with difficulty. Acute poisoning occurs only on intravenous administration; the chief symptoms of such poisoning are convulsions in mice and rabbits, and intestinal symptoms in dogs similar to those in *As* poisoning. In rabbits, the respiratory, vagus, and vasomotor centers are stimulated. The muscles of the heart, the blood vessels, and the intestine, and quite probably, the parasympathetic nerve elements in the intestinal wall are stimulated, while the motor nerve endings and the skeletal muscle are paralyzed. An antagonism between morphine and dehydromorphine apparently does not exist; the action of dehydromorphine is usually intensified by morphine; but the irritability of the respiratory center, decreased by morphine, can be restored by means of dehydromorphine. J. S. H.

Antagonism between calcium and magnesium. SŌMEI TO. *Acta Schol. Med. Univ. Imp. Kioto* 3, 441-53(1920).—Mg exerted a paralyzing action on all the organs studied. The action of Ca depended on both the organ and the concn., and was at times stimulating, at times paralyzing. When Ca and Mg were used in combination, an antagonistic action might occur not only with organs which were influenced differently by the 2 cations, but also with organs on which the two cations had the same action. The vasodilating action of Mg was counteracted by a vasodilating concn. of Ca. The uterus and intestine were paralyzed by large doses of Ca; yet these doses counteracted the paralyzing action of Mg. Skeletal muscle was paralyzed by both Ca and Mg; and the action of the two cations was additive on such muscle; however on indirect stimulation, the two cations were found to have a directly antagonistic action on the motor nerve endings. The results may be summarized: $MgCl_2$ exerted a paralyzing action on the heart, intestine, uterus, skeletal muscle and motor nerve endings, and produced vasodilation and a fall in blood pressure. $CaCl_2$ stimulated the heart, paralyzed the skeletal muscle, increased the blood pressure, acted as a vasodilator in small doses and as a vasoconstrictor in large doses, stimulated the intestine and the uterus in small doses and paralyzed both organs in large doses. When combinations of the two salts were used, antagonism was noted with respect to the action on the heart, vascular system (even with small doses), blood pressure, motor nerve endings, and both the intestine and uterus even with large doses; antagonism did not occur with respect to the action of the combinations on skeletal muscle. JOSEPH S. HEPBURN

Changes in the blood in the course of intoxication by ypérite (mustard gas). EDGARD ZUNZ. *Ambulance de l'océan* 2, 411-25(1919).—The count of erythrocytes in the venous blood, its coagulability, and its antitryptic power underwent little or no change in 15 cases of severe intoxication of soldiers by ypérite. The leucocyte count of the venous blood tended at times to range between 5000 and 6000 from the 4th day after poisoning for a longer or shorter period of time; it was very low 12 to 16 hrs. before death which occurred in 1 soldier (the only fatal case) from broncho-pneumonia. The reserve alkali of the serum generally showed a slight decrease in the poisoned soldiers, and underwent a considerable decrease 12 to 16 hrs. prior to death in the one case of broncho-pneumonia. JOSEPH S. HEPBURN

Blood pressure in intoxication by ypérite (mustard gas) and arsine. EDGARD

ZUNZ. *Ambulance de l'océan* 2, 427-44(1919).—The study was made on soldiers who were poisoned by ypérite or by a mixt. of ypérite and phenyldichloroarsine. Often, after 5 to 8 days or even longer, the diastolic or minimum pressure was lowered to approx. 50 mm. of Hg and might remain thus for a considerable period of time. The systolic or max. pressure at times became as low as 125 mm. of Hg, or even less; it remained low as a rule for a shorter period of time than did the diastolic pressure. The difference between the two pressures sometimes was less than normal. The changes in blood pressure had no relation to changes in body temp., number of respirations, or pulse. The cardiac rhythm might be accelerated or retarded or show both changes on the same day. The number of respirations frequently was increased.

JOSEPH S. HEPBURN

Some histological changes produced in cases of fatal poisoning of man by ypérite (mustard gas). J. DE HARVEN AND EDGARD ZUNZ. *Ambulance de l'océan* 2, 475-84 (1919).—In severe poisoning by ypérite, the epithelial lining of the larynx and especially of the trachea beneath the vocal cords disappears very rapidly; and these ulcerated organs show a very marked congestion. A fibrinous inflammatory exudate soon appears, and contains a larger or smaller number of microorganisms, which gradually increase and invade the bronchi and the alveoli. Finally they form foci of infection at times only bronchic and peribronchic, at times alveolar with hemorrhagic and polynuclear infiltration. These lesions apparently form more readily at the base rather than at the apex of the lung. At times atelectasis of the alveoli occurs at the base, emphysema at the apex. Necrosis may attack the pulmonary tissue, of which it then sometimes becomes very difficult to recognize the structure.

JOSEPH S. HEPBURN

Elimination of treponema in children by mercury inhalation. J. LEWENGOOD. *Arch. Pediatrics* 38, 246-7(1921).—The subjects were 33 children, age 5 to 14 years, showing Wassermann reactions from 2 plus to 4 plus. The Hg prepn. (mercupressen, spirocide) contained Hg, Cu, and vegetable matter, and burned readily with complete volatilization of the Hg. A sheet was placed over the child's head like a tent; the eyes were bandaged to prevent smarting; a suitable dose of the prepn. was ignited beneath the sheet; and the child inhaled the fumes; the time required was approx. 15 min. Six treatments on successive days usually sufficed, though some patients required 9 or even 12 treatments. Care was necessary to avoid symptoms of salivation. The treatment rendered the Wassermann reaction negative.

JOSEPH S. HEPBURN

Action of potassium, rubidium, and cesium on the heart. L. BECCARI. *Arch. sci. biol.* 1, 22-36(1919); *Physiol. Abstracts* 5, 130.—Very small doses of K exert an exciting action on the heart and the skeletal muscle of the frog, larger doses are toxic and have a paralyzing action. Rb also exerts this specific exciting action on the frog heart, while Cs lacks this power. Both Rb and Cs in larger dosage have a toxic action like K. As the at. wt. of the metal increases, the exciting action decreases and the paralyzing action increases; both actions are a function of the at. wt.

J. S. H.

Nitrous oxide as an anesthetic agent. EVERETT A. TYLER. *Hahnemannian Monthly* 56, 317-22(1921).—A review.

JOSEPH S. HEPBURN

Anticoagulant action of sodium citrate. GEORGE R. LOVRE. *Hahnemann Med. Coll., Chicago. J. Am. Inst. Homeopathy* 13, 834-41, 944-51(1921).—From expts. made on dogs, or with their blood *in vitro*, the following conclusions are deduced. Dilm. of blood with 0.85% NaCl soln. does not markedly retard the coagulation time, provided the blood form more than approx. 10.5% by vol. of the mixt. When the blood forms from 1.1% to 10.5% by vol. of the mixt., the velocity of coagulation varies directly with the concn. of the blood, i. e. coagulation is a monomolecular chem. reaction. Na citrate apparently acts as an anticoagulant by thromboplastic inhibition, not by Ca inactivation. The ability of Na citrate to retard normal coagulation varies at the 6th power of its concn.; its ability to retard abnormally delayed coagulation varies directly with its concn.; therefore, the two processes are different chem. reactions. Rapid

intravenous injection of toxic doses of Na citrate retards coagulation and increases the time required for coagulation; this effect lasts for only a very short period of time. Administration of Na citrate subcutaneously or by means of the stomach tube does not affect the coagulation time. Intravenous injections of a mixt. of CaCl_2 , NaCl , NaHCO_3 and HCl had no influence on the coagulation time. JOSEPH S. HEPBURN

Survey of carbon monoxide poisoning in American steel works, metal mines, and coal mines. HENRY S. FORBES. Harvard Univ. *J. Ind. Hyg.* 3, 11-5(1921).—CO, as it occurs in metal and coal mines and about blast furnaces in the U. S., rarely gives rise to late after-effects as a result of acute, severe gassing; such effects, when noted, almost always occur in persons in whom evidence points to a pre-existing pathological condition. While headache and malaise follow frequent exposure to CO, no evidence exists of a cumulative injurious effect. The compensating increase of hemoglobin and erythrocytes from prolonged O-want, makes an acquired tolerance to CO possible to a certain extent. Recovery is 3 times as rapid when O_2 containing CO_2 is administered by inhalation as when only O_2 is given. An efficient portable respirator for use in cases of CO poisoning has been perfected. A bibliography is appended. J. S. H.

Discussion of the etiology of so-called aniline tumors of the bladder. ALICE HAMILTON. *J. Ind. Hyg.* 3, 16-28(1921).—The conclusion is reached that tumors of the bladder in aniline dye workers are due to the slow toxic action of small amts. of AsH_3 and not to such causes as highly diluted $\text{C}_6\text{H}_5\text{NH}_2$ vapors or benzidine dust. A bibliography is appended. JOSEPH S. HEPBURN

Relative sensitiveness of sensory and motor nerve fibers to the direct application of drugs. Y. OZAKI. *Kyoto Igaku Zasshi* 15, No. 1, 27-71(1918); *Jap. Med. Literature* 6, 1-2(1921).—The isolated sciatic nerve of the frog was used for the expts. The sensory fibers were paralyzed more rapidly than the motor fibers by distd. water, a hypertonic soln. of glucose in Ringer soln., and solns. of neutral salts in Ringer soln. KCl and MgCl_2 paralyzed the sensory endings almost immediately. Acids and alkalis influenced both types of fiber to about the same extent. Anesthetics (EtOH , urethan, chloral hydrate) and antipyretics (acetanilide, antipyrine) acted slightly more rapidly on the sensory fibers. Cocaine acted more rapidly on the sensory fibers. While the action of strychnine- HNO_3 , atropine- H_2SO_4 , and apomorphine- HCl was slow, it was more rapid in the case of the sensory fibers. Tetrodotoxin and veratrine- HCl acted rapidly, and their action was more powerful on the sensory fibers; PhOH acted far more powerfully on these fibers. Aconitine acted rapidly, and approx. equally on both types of fiber. Curare and guanidine- HCl had no effect, and morphine, pilocarpine, and heroine- HCl practically no effect on either type of fiber. JOSEPH S. HEPBURN

Intestinal lesions produced by the excretion of poisons. N. OKUBO. *Kyoto Igaku Zasshi* 15, No. 2, 156-297(1918); *Jap. Med. Literature* 6, 4(1921).—When certain poisons such as Bi, Hg, Cr, As, ricin, cantharidin, snake venom, and some bacterial poisons, are introduced into the animal body, they are partly excreted through the mucous membrane of the gastro intestinal tract. The resulting enteritis is usually most marked in some definite portion of this tract, but is far more diffuse and uniform throughout the tract in very young animals, indicating a less complete development of the tissue and differentiation of its function. For instance, in the young animal Bi granules are deposited diffusely in the lining epithelium and even in the glandular epithelium of the entire intestine, while they are chiefly coned. in the adult in the epithelial cells at the tips of the villi in the lower portion of the small intestine. JOSEPH S. HEPBURN

Subconjunctival injections of salt solution. I. MUKAI. *Nippon Gankwagakkai Zasshi* 22, 300-13(1918); *Jap. Med. Literature* 6, 12(1921).—These injections produced an increase in the protein content of the aqueous fluid (humor?). A 2% soln. produced the greatest increase, followed, in descending order, by distd. water, 0.2%, 0.4%, and 1% solns. JOSEPH S. HEPBURN

Action of the venom of *Naja tripudians* on the heart of the rabbit. O. B. MONTES. *Prensa Med.* (Argentina) 1920, No. 6; *Physiol. Abstracts* 5, 146.—The venom of the cobra (*Naja tripudians*) acts on the isolated heart of the rabbit in diln. of 1:100,000 to 1:5,000,000, producing marked contraction, accelerated beating, and finally arrest in systole.

JOSEPH S. HEPBURN

Adsorption of poisons by constituents of the animal body. I. The adsorptive power of serum and brain substance for cocaine. L. EERLAND AND W. STORM VAN LERUWEN. *Proc. Acad. Sci. Amsterdam* 22, 831-49(1920).—Expts. were made concerning the action of cocaine on the gastrocnemius-ischiadicus prepn. of the frog, *Rana esculenta*. The action of the cocaine was considerably inhibited by the addition to its soln. of the serum of man, dog, rabbit, and guinea pig, the brain substance of the rabbit and cat, the ether ext. of dried cat's brains or lecithin. This inhibition was due, not to a chem. decompn. of the cocaine, but to its physical adsorption; for when a mixt. with reduced cocaine-activity was extd. with alc. and HCl, all the cocaine was recovered, had retained its activity, and had a m. p. close to the normal. Serum, brain substance, and lecithin in themselves were without action on the nerve; and this also held true of the extractives obtained from these substances by treatment with alc. and HCl.

JOSEPH S. HEPBURN

Thromboplastic action of chloroform. P. NOLF. *Réunion soc. belge biol.* 1920, 588; *Physiol. Abstracts* 5, 179.—CHCl₃, and to a lesser extent Et₂O, produces coagulation of avian plasma completely freed from the cells, and also of the oxalated plasma of both birds and mammals. There is no action on avian plasma which has undergone several successive treatments with pptd. Ca₃(PO₄)₂ which removes thrombin and its precursors. Hence CHCl₃ does not directly coagulate the fibrinogen, but acts as a thromboplastic agent. Possibly this thromboplastic action of CHCl₃ and Et₂O is connected with their action in rendering insol. a portion of the proteins of the plasma.

JOSEPH S. HEPBURN

Plasma treated with phosphate, its coagulation. P. NOLF. *Réunion soc. belge biol.* 1920, 589-92; *Physiol. Abstracts* 5, 179(1920).—Expts. were made with oxalated plasma which had been treated with an emulsion of Ca₃(PO₄)₂, then subjected to centrifugation. The results tended to show that this so-called pure soln. of fibrinogen still contained all the factors required for coagulation, in addition to antithrombin. This antithrombin masked the presence of the precursors of thrombin, and imparted to the plasma its great stability.

JOSEPH S. HEPBURN

Thromboplastic action of chloroform in an oxalated medium. P. NOLF. *Réunion soc. belge biol.* 1920, 651-2; *Physiol. Abstracts* 5, 179.—Free thrombin, which coagulated a soln. of pure fibrinogen, was found in the serum which was obtained from the oxalated plasma of a bird by producing coagulation by means of CHCl₃ in the absence of Ca salts; this serum contained no fibrinogen.

JOSEPH S. HEPBURN

Antagonistic actions of salt solutions as revealed by their different action upon the free motile cell. A. KOEHLER. *Z. allgem. Physiol.* 18, 163-225(1919); *Physiol. Abstracts* 5, 119.—The movements and the period of life of infusoria in different salt solns. were used as a measure of the toxicity of different ions. No relationship was found between the antagonistic actions of salts and the reaction and dissociation of their solns. The conclusion is drawn that no adequate theory can be advanced to explain the antagonism of salts.

JOSEPH S. HEPBURN

The antiseptic potency of acriflavine, with considerations on the variability of results in testing antiseptics. C. H. BROWNING AND R. GULBRANZEN. Univ. of Glasgow. Bland-Sutton Inst. of Path., London. *Brit. J. Exptl. Path.* 2, 95-102(1921).—Acriflavine (diaminoacridine methochloride) in heated ox serum will sterilize *B. coli* in 1 in 100,000 and *S. aureus* in 1 in 200,000. The action in peptone water is more pronounced in a slightly alk. medium than in one more acid. The sterilizing concn.

is independent of the size of the inoculum. No rapid exhaustion or deterioration of the antiseptic was found to occur in the medium. Different specimens of acriflavine gave similar results but certain specimens were more irritating to the conjunctiva than others. This property may be important where the substance is employed in treating an infection of a delicate membrane. The occurrence of variation in the sterilizing dose in successive tests, and of irregularity in the action of different concns. of antiseptic in the same series, is noted and it appears that such differences are due to factors which cannot at present be completely defined.

HARRIET F. HOLMES

The effect of tobacco on the vascular wall. TSANG G. NI. *J. Lab. Clin. Med.* 5, 534-7(1920).—A review of the literature.

E. R. LONG

A comparison of the electrical conductance of electrolytes and their toxicities to fish. E. B. POWERS. Univ. Ill. *Am. J. Physiol.* 55, 197-200(1921).—Relative toxicity of NaCl, CaCl₂, BaCl₂ and MgCl₂ in concns. of 0.025 M to 0.333 M were compared with the elec. cond. at various temps. with minnows of *Pimephales notatus* Raf. as exptl. animals. There seems to be no direct relation between relative toxicity and relative elec. cond.

J. F. LYMAN

The action of the HCO₃ ion and of morphine on the respiratory center. J. B. COLLIP. Univ. Alberta. *J. Physiol.* 54, 58-61(1920).—Administration of NaHCO₃ intravenously may result in increased respiratory activity. Instillation of NaHCO₃ into the spinal fluid results practically at all times in definite stimulation of the respiratory center. The results point to the sp. sensitivity of the respiratory center to the HCO₃ ion. It is possible, however, that a disturbance in the cation equil. in the nerve cells as a result of NaHCO₃ administration may be the chief basis for the observed stimulatory action of NaHCO₃.

J. F. LYMAN

The effect of varying the hydrogen-ion concentration and of guanidine sulfate on the excitability of the neuro-myton of the frog. MARGARET H. GRANT. Univ. Glasgow. *J. Physiol.* 54, 79-83(1920).—An increased excitability of frogs gastrocnemius muscle was obtained only at a point beyond $pH\ 10^{-7}$ on the alk. side, clearly outside physiol. limits. With guanidine excitability of muscle was increased in 0.125, 0.25 and 0.5% solns. The increase was followed by a cuare-like effect. Higher concns. of guanidine caused a rapid onset of the curare action, while solns. containing less than 0.125% gave results resembling those in 0.75% NaCl.

J. F. LYMAN

The action of potassium and uranium on the frog heart. A. J. CLARK. *Proc. Physiol. Soc. J. Physiol.* 54, xv(1920).—Although U will excite a heart arrested from lack of K, yet it cannot be said to replace K in the manner in which Rb replaces K.

J. F. LYMAN

Profound effects of digitalis on the vagus, producing severe detrimental subjective symptoms, as shown by simultaneous electro-cardiograms and pneumograms. R. H. HALSLEY. N. Y. Post-Grad. Med. School. *Proc. Soc. Exptl. Biol. Med.* 17, 36-8(1919).—In a case showing auricular fibrillation, digitalis was given to slow the ventricular rate. This was about 100 during apnea and slowed to about $1/2$ this rate during hyperpnea. The man complained of increasing distress, most severe during hyperpnea. To see whether releasing the heart from vagus control might give relief, $1/40$ gr. of atropine was given by hypodermic injection. In 27 min. the ventricle beats irregularly at the rate of 160 per min. but was uninfluenced by breathing. The patient became comfortable and the cyanosis was less. The distress of the patient was due to the diminished interchange of O₂ and CO₂ between the lungs and blood, which was least during apnea. Without digitalis the amt. of interchange was sufficient to keep the patient comfortable; but when digitalis was given, the vagus became more susceptible to lung reflexes, and slowed the circulation so as to diminish this interchange sufficiently to cause real distress. Release from vagus control gave relief.

V. C. MYERS

The action of camphor on the central nervous system of the squid. A. R. MOORE.

Rutgers Col. *Proc. Soc. Exptl. Biol. Med.* 17, 38-9(1919).—Newly hatched squid, if put into a soln. of camphor gum in sea H_2O , $1/10$ satn., show mantle spasms, involving play of the chromatophores, after a latent period of about 40 sec. at 24° . This is due to the action of camphor on the stellar ganglia. In appearance, camphor spasms are indistinguishable from those caused by nicotine. The difference lies in the locus and nature of neuronc excitation. Camphor spasms soon pass off and the animals lie inert, but they may again be thrown into spasms by treatment with strychnine or nicotine. There is no interference between the action of nicotine and that of camphor, for if the squid are immersed in nicotine soln. for 1 min., then in a soln. of camphor, the camphor spasms take place, after which the animals lie quiet for several min. At the end of the required latent period typical nicotine spasms take place.

V. C. MYERS

Concerning the toxicity of acetanilide and bicarbonate combinations for muscle-nerve preparations. D. I. MACHY. Johns' Hopkins Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 44-5(1919).—It is well known that acetanilide when given with small doses of $NaHCO_3$ is less toxic than when given in the same doses alone. M. has investigated the effect of acetanilide soln., alone and combined with $NaHCO_3$, on gastrocnemius muscle-nerve preps. of a frog. On testing the excitability of the muscles and nerves at regular intervals after treatment with the drugs, it was found that the plain acetanilide soln. tends to paralyze and finally kill the sciatic nerve more quickly than the soln. of acetanilide and $NaHCO_3$. This slower toxic action of the combination would render the drug less poisonous when injected into an animal than acetanilide would be if injected alone, for in the former case, the poison might be excreted before its toxic effect could take place.

V. C. MYERS

Dextrose plethora and its antipyretic effect in coli fever. H. G. BARBOUR AND A. J. HOWARD. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 150-4(1920).—It was found difficult to give dextrose by mouth in such a dose as constantly to affect the temp. of normal or of fever dogs. The antipyretic effect (not noted in health) of intravenous dextrose injections appears to be due to osmotic action by which in fever dogs an unusually profound increase in the fluids of the blood results for a short time. This increase in fluid is of value to the animal in promoting heat elimination. The tissues in coli fever appear to contain a higher % of "available H_2O " than is normally present. Sensitivity to antipyretic drugs can thus be accounted for.

V. C. MYERS

The effect of therapeutic doses of digitalis on the contraction of heart muscle. A. E. COHN AND R. L. LEVY. Hosp. Rockefeller Inst. Med. Research. *Proc. Soc. Exptl. Biol. Med.* 17, 160-2(1920).—With doses of therapeutic range equal to 30% of the calcd. lethal dose, digitalis and strophanthin increased the contractile power of the cardiac muscle and thus increased the vol. output. Therefore, these drugs may exercise a beneficial action. The T wave is usually altered and there is a transient elevation of blood pressure.

V. C. MYERS

Blood changes in ether anesthesia. D. D. VAN SLYKE, J. H. AUSTIN AND G. E. CULLEN. Hosp. Rockefeller Inst. Med. Research. *Proc. Soc. Exptl. Biol. Med.* 17, 169-70(1920).—During light ether anesthesia the bicarbonate content of arterial blood falls, the CO_2 tension and H^+ concn. rise, indicating uncompensated acidosis. The O satn. increases from accelerated ventilation in response to the stimulus of increased CO_2 tension. The acceleration is not sufficient to keep the CO_2 tension and H^+ concn. down to normal. Even in light etherization the respiratory center appears to be markedly deadened. In deep etherization the CO_2 tension rises still higher and the pH may fall below 7.2. Respiration may be so retarded that the O satn. of arterial blood falls below that normal for venous.

V. C. MYERS

The influence of phenylcinchoninic acid and its methyl derivative on the uric acid and urea content of the blood. V. C. MYERS, J. A. KILLIAN AND G. E. SIMPSON.

N. Y. Post-Graduate Med. School and Hosp. *Proc. Soc. Exptl. Biol. Med.* **17**, 187-9 (1920).—Data are given on 2 cases in which there is evidence of a drop in the blood urea as well as in the uric acid, after administration of 50 gr. tolysin or cinchophen daily for several days. There was no apparent effect on the blood creatinine. V. C. MYERS

The effect of solutions of certain salts and colloids on the permeability of the capillary walls. A. H. SMITH AND L. B. MENDEL. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* **17**, 201 (1920).—After intravenous injection into rabbits of certain materials, in isotonic soln., the diffusion out of the circulation was estd. by the relative concns. of the blood as shown by the hemoglobin. The blood vol. returned to normal in 30 min. when NaCl, NaBr, NaSCN, NaNO₃, or CH₃COONa, was used. When the tartrate, citrate or sulfate was used the blood vol. remained above normal for several hrs. at least. • HCl, CaCl₂, or colloidal Ag produced no delay in the removal of fluid from the circulation, while acacia caused the blood vol. to remain $\frac{1}{2}$ above normal for over 2 hrs. There was no edema nor increased H₂O content of the muscles, the excess fluid being eliminated through the intestines, kidneys, and into the serous cavities.

V. C. MYERS

Effects of pilocarpine upon salivary fistula dogs before and after coli injection. H. G. BARBOUR AND B. P. FREEDMAN. Yale Univ. School Med. *Proc. Soc. Exptl. Biol. Med.* **17**, 208-9 (1920).—The curve of secretion of saliva (by fistula of Wharton's duct) was observed in 2 healthy dogs after injections of 0.5 mg. per kg. of pilocarpine-HCl. The secretion increased with each expt.; after 6 to 8 injections the results became more constant. The effect of injection of $\frac{1}{2}$ cc. per kg. of coli vaccine was noted when the pilocarpine was injected at the height of the fever, and it was found that the secretion curves exhibited an unusually slow onset and a much diminished max. and total secretion. The saliva was thicker in consistency than normal. It is suggested that the thickening of the blood shown at this stage of fever is a cause of diminished secretion in fevers.

V. C. MYERS

Temperature changes induced by gum acacia injections in normal and fevered animals. H. G. BARBOUR AND L. H. BARETZ. Yale Univ. School Med. *Proc. Soc. Exptl. Biol. Med.* **17**, 209-10 (1920).—In rabbits acacia injections induced a mild temp. depression in health but a marked antipyretic effect in fever. Intravenous acacia injections raise the temp. of normal dogs, but in fever dogs exert a brief though marked antipyretic action, accompanied by increased blood vol. This latter phenomenon is obviously parallel to the antipyretic effect of intravenous injections of 50% glucose.

V. C. MYERS

Alterations of intracranial tension by salt solutions in the alimentary canal. H. CUSHING AND F. E. B. FOLEY. Harvard Med. School and Peter Bent Brigham Hosp. *Proc. Soc. Exptl. Biol. Med.* **17**, 217-8 (1920).—It is possible to reduce the cerebrospinal fluid pressure and diminish the bulk of the brain by injecting a hypertonic soln. into the blood stream. Hypotonic solns. have the opposite effect. There are undesirable effects on pulse, respiration and blood pressure which might contraindicate the use of such injections with patients having increased degrees of intracranial tension. Gastro-intestinal doses of such solns. were found to have the same corresponding effects on pressure in animals and in patients, without the undesirable effects on pulse.

V. C. MYERS

Alcoholism and the behavior of white rats. I. The influence of alcoholic grandparents upon maze behavior. E. C. MACDOWELL AND E. M. VICARI. Station Exptl. Evolution, Cold Spring Harbor, Long Island, N. Y. *J. Exptl. Zool.* **33**, 209-91 (1921).—The grandparents of the rats used in these expts. were treated with EtOH vapors once each day from weaning till conception in the case of the males, or till birth of the litter in the case of the females. The controls were the grandsons and granddaughters of untreated rats of the same litters from which the treated rats were selected. The

descendants of the alcoholic parents were less successful than the untreated rats in their ability to learn the way to the center of a maze where food was placed. Since the alc. treatment was the *only basis* upon which the rats were divided into the 2 groups, it is believed that the alc. was responsible for the inferiority of the treated rats. The results indicate that inheritance can be modified in a certain measure by alc. and suggest the possibility that other compds. having similar powers may be found.

CHAS. H. RICHARDSON

Effect of poisons which effect temperature upon animals deprived of the heat-regulating mechanism. II. R. ISSENSCHMID. *Arch. exp. Path. Pharm.* **85**, 271-99 (1920); cf. *C. A.* **8**, 2000.—Intoxication with tetrahydro- β -naphthylamine or infection with the organism of swine erysipelas induces an increase in the energy exchange of rabbits whose heat-regulating mechanism has been destroyed by operation. The O_2 consumption and CO_2 elimination are increased, as is the urinary N. Possibly this last is due to the inanition. The administration of caffeine and cocaine to such animals causes elevation of temp. but the higher temp. may be due to either increased heat production or decreased heat elimination. The increase in temp. resulting from sodium salicylate is associated definitely with increased metabolism. G. H. S.

Osmotic changes in the blood after infusion of hypertonic sugar solutions. WARNER LIPSCHUTZ. *Arch. exp. Path. Pharm.* **85**, 359-88(1920).—In order to study the phenomena associated with hydremia, concd. glucose solns. (25%) were injected intravenously into rabbits and cats in amts of 35-85 cc. Detns. of various types were made upon the blood and urine. It was found that about $\frac{1}{3}$ of the sugar injected was eliminated in the urine during the first 6 hrs. The total solids of the blood showed a decrease. The sugar in the blood maintained a high concn. for some time. The hemoglobin percentage fell sharply after the injection but was restored to normal quickly. Blood chlorides decreased immediately after the injection but were returned to normal within an hr. and then increased further. The total N of the blood and the serum N tended to decrease but were variable, as indeed, were most of the factors studied. G. H. S.

Prevention of acute arsphenamine reaction by antianaphylaxis and atropine. GEORGE S. BUSMAN. *J. Am. Med. Assoc.* **76**, 1302-5(1921).—Summary: The exact nature of nitritoid (or anaphylactoid) and gastrointestinal reactions to arsphenamine is undetd. A variety of causes may act to produce a single syndrome of which the acute reaction on the table, and in certain cases, the late gastrointestinal reaction may be phases of the same phenomena. Among the cases reported, repeated nitritoid crisis, associated with repeated gastrointestinal reaction, persisted regardless of any controllable factor in the technic. Repeated uncontrollable acute reactions are interpreted as personal idiosyncrasies of the patients to the drug. The observations of Stokes on the value of atropine and of induced antianaphylaxis (Besredka technic) in the control of a persistent tendency to acute nitritoid crisis is confirmed. It has been further found that a tendency to repeated late gastrointestinal reaction can also be controlled in a large number of cases by either the Besredka technic or atropine, or a combination of the two methods. Atropine is sometimes effective in doses less than one-fiftieth of a grain, or this dose may fail entirely to affect reaction. A combination of the use of atropine and the induction of antipylaxis by dividing the dose of arsphenamine is more effective than the employment of either method alone. A combination of the 2 methods may make possible the continuance of arsphenamine treatment in patients in whom repeated severe reaction would otherwise force its abandonment. L. W. RIGGS

Granuloma from indelible pencil. MAX BALLIN AND HARRY C. SALTSTEIN. *J. Am. Med. Assoc.* **76**, 1333(1921).—Indelible or copying pencils are made of a mixt. of graphite, alum, kaolin and a basic aniline dye of the triphenylmethane group, generally methyl violet. Aniline dyes rubbed into the skin produce hypertrophy of the epithelium and if persisted in a carcinoma will develop. Pieces of indelible pencil broken

off in the tissues should be immediately and thoroughly removed. If extd. within an hr. there is no further trouble. After this the aniline violet dissolves and invades the tissues, causing irritation and the gradual formation of granulomas. When the process has progressed to this stage, complete excision of all stained tissue is required.

L. W. RIGGS

Spirocheticidal value of disodium ethyl arsenate (mon-arsone). HENRY J. NICHOLS. U. S. Army. *J. Am. Med. Assoc.* 76, 1335-6(1921); cf. Wright, *et al.* *C. A.* 14, 1713.—The drug tested on rabbits infected with syphilis showed no spirocheticidal power. The tissues are fatally poisoned as soon as or before the spirochetes are affected. For practical use in syphilis there is no such germicidal basis as exists in the case of the arspenamine group.

L. W. RIGGS

The alkaloids of valerian (GÖRIS, VISCHNIAC) 17.

BLYTH, ALEXANDER W. AND BLYTH, MEREDITH W.: **Poisons: Their Effects and Detection.** 5th Ed. revized and enlarged. New York: D. Van Nostrand Co. 779 pp. \$12.00.

McMECHAN, F. H.: **The American Year Book of Anesthesia and Analgesia.** New York: Surgery Publishing Co. 483 pp. \$10. For review see *J. Am. Med. Assoc.* 76, 1787 (1921).

I—ZOOLOGY

R. A. GORTNER

Post-mortem melanin pigment formation in pigmentless retinas and choroids of white ring-doves. OSCAR RIDDLE AND VICTOR K. LAMER. *Am. J. Physiol.* 47, 103-123(1918).—Results presented are a contribution to: the mechanism of melanogenesis; the conditions necessary for post-mortem pigment formation; and the role of the hypothetical "genetic factors" in the inheritance of color. The studies were based on embryonic tissues of white ring-doves or of later generations of "extd." whites from crosses with blond ring-doves. The post-mortem formation of melanin (black) pigment was shown to occur in the retina-choroids of white dove embryos of 3 to 12 days development. Pigment production did not occur in earlier stages and is not as readily produced, possibly not at all, in the full-term or just-hatched embryos. Development of the pigment was not prevented by killing the tissues in $HgCl_2$. No pigment formation occurred in the few tested embryos previously subjected to a temp. of 100° to 107° . Free O_2 was required for production of the pigment; formation occurred in percentages of O_2 varying between that present in air and 100%. The pigment fails absolutely to form in a CO_2 atm. The inner ring of iridial pigment present in older living embryos seems to disappear entirely when kept after death in the presence of high percentages of CO_2 . The facts of post-mortem melanin formation bear on current theories of color inheritance and development. They coincide with a view previously advanced, and present difficulties and limitations to the "presence and absence" hypothesis of color development.

HATTIE L. HEFT

Inquiry into the distribution of potassium compounds in the electric organ of the thorn-back (*Raja clavata*). M. W. WOERDEMAN. Univ. Amsterdam. *Proc. Acad. Sci. Amsterdam* 23, 842-7(1921); *Verslag Akad. Wetenschappen Amsterdam* 29, 567-72(1921).—The elec. organ is derived from voluntary muscle, and consists essentially of elec. platelets imbedded in jelly-like connective tissue. Frozen sections were cut. Use was made of Macallum's procedure for staining of K: (A) Treatment with soln. of $Na_2Co(NO_2)_6$ to ppt. $K_2Co(NO_2)_6$ wherever K occurred in the tissue. (B) Subsequent treatment with $(NH_4)_2S$ to ppt. black CoS from this double KCo salt. K was found in both the anterior and the posterior cortical layers as a local ppt., and in the inner layer in biochem. condensation. The electrolemma was apparently free from K. Stress is placed upon: (1) The abundance of K in the elec. platelets and the slight

amt. of K in the surrounding jelly. (2) The occurrence of a large ppt. of K on the boundary between the anterior cortical layer and the inner layer. (3) The occurrence in the inner layer of the peculiar distribution of K compds. which is characteristic of voluntary muscle.

JOSEPH S. HEPBURN

Carbonic acid as an agent of experimental parthenogenesis in the sea urchin (*Paracentrotus*). M. HERLANT. *Réunion soc. belge biol.* 1920, 188-90; *Physiol. Abstracts* 5, 194.—The eggs are kept for 1.5 to 2.0 min. in sea water previously satd. with CO₂ under pressure in a pressure flask; they are next placed in ordinary sea water for 20 to 30 min., then in a hypertonic soln. (50 cc. sea water plus 8 cc. 2.5 molar NaCl soln.) for the same period of time. The results are comparable to those obtained by the use of butyric acid. The CO₂ activates the egg; the hypertonic soln. causes formation of accessory asters, and assures the bipolarity of the mitosis and the segmentation.

JOSEPH S. HEPBURN

Studies on organic regulation. I. The composition of the urine and the blood of the hibernating frog, *Rana virescens* Kalm. H. C. VAN DER HEYDE. W. Virginia Univ. Med. School. *J. Biol. Chem.* 46, 421-30(1921).—The urine of the hibernating frog contains on an av. 20.6 mg. of total N, 38.7 mg. of urea, 1.27 mg. of NH₃ and 0.17 mg. of uric acid per 100 cc. Neither creatine nor creatinine are present, and the presence of allantoin could not be demonstrated. A frog weighing about 60 g. excretes about 10 cc. of urine daily, containing 2 mg. of N, 3.2 mg. of urea, 0.5 mg. of NH₃ and 0.029 mg. of uric acid. Temp. has a very marked effect on the amt. of excretory products. In 100 g. of frog blood there is an av. of 17 mg. of non-protein N, 3.5 mg. of urea, 1.3 mg. of uric acid, no NH₃. Differences in H₂O intake have a great influence on the concn. of these substances in the blood. Amino-acids are present but the amt. is too small to be quantitatively detd. The estns. have been made preliminary to an investigation on the resorption of material during the involution of the tad pole's tail. A. P. LOTHROP

Anaerobic respiration in some pelecypod mollusks. The relation of anaerobic respiration to glycogen. C. BERKELEY. Marine Biol. Station, Nanaimo, B. C. *J. Biol. Chem.* 46, 579-98(1921).—Carbohydrates are the only substances which have been shown to possess the power of stimulating vital activity under anaerobic conditions and the investigation was undertaken to correlate the anaerobic respiration of the animals used with their carbohydrate constituents. Expts. were carried out with each of 3 species of clams to det. the effect on the glycogen content of submersion in boiled-out sea water in sealed vessels and with each of 2 species in boiled-out sea water through which a current of pure H was passed. CO₂ was produced under these anaerobic conditions by all 3 species, *Mya arenaria*, *Paphia staminea* and *Saxidomus gigantea*. In the case of the first two species no loss of glycogen occurred. Anaerobiosis in *Saxidomus gigantea* was invariably accompanied by a disappearance of glycogen, but the glycogen lost was not nearly sufficient to account for the CO₂ produced on the assumption that the O of the CO₂ was obtained by the dissociation of H₂O (Mathew's theory of anaerobic respiration) and that all the H freed reduced the glucose resulting from the hydrolysis of glycogen. The relation between glycogen consumption and CO₂ production corresponded to a complete breakdown of the glycogen into CO₂ and CH₄, according to the equation $C_6H_{12}O_6 + H_2O = 3CO_2 + 3CH_4$. Cellulose, an isomer of glycogen, is known to decompose in this way under the action of anerobic bacteria. More CO₂ per unit of wt. of tissue was formed in the current of H than in a sealed vessel by both *Paphia staminea* and *Saxidomus gigantea*. Under aerobic conditions *Saxidomus gigantea* produced less CO₂ than in a current of H; *Paphia staminea* produced approx. identical amts. under the two conditions. A. P. LOTHROP

Sugar in the blood of the dog fish and of the sand shark. E. L. SCOTT. Columbia Univ. and Marine Biol. Lab. Woods Hole. *Am. J. Physiol.* 55, 349-54(1921).—Sugar is occasionally absent from the blood of the dog fish, *Megaelus chinis*, such fish

usually seem to be in a subnormal condition. Asphyxia, induced by exposure of the fish to air, causes a rapid rise in blood sugar which is followed by a fall to a value near normal. The av. concn. of sugar in the blood of dog fish is about the same as for the dog and cat, *vis.* .065%. The amt. found in the blood of sand sharks is about the same.

J. F. LYMAN

Sugar in the blood of the common frog. E. L. SCOTT AND NATHAN KLEITMAN. Columbia Univ. *Am. J. Physiol.* 55, 355-61(1921).—The av. blood-sugar content for ordinary frogs for Feb., March and Apr. is .037%. During these months the males show a lower blood sugar than do the females. No changes in blood sugar were noted during the onset of the breeding season. Frogs kept at low temps. for a few days showed an increase in blood sugar.

J. F. LYMAN

Sugar in the blood of normal pigeons. E. L. SCOTT AND HANNAH E. HONEYWELL. Columbia Univ. *Am. J. Physiol.* 55, 362-5(1921).—Pigeons have a higher blood-sugar content (.185%) than is normal for mammals. In this respect the pigeon resembles other birds.

J. F. LYMAN

Control of sucking insects with dust mixtures. P. J. PARROTT. Agr. Expt. Station, Geneva, N. Y. *J. Econ. Entomology* 14, 206-14(1921).—Dusts contg. nicotine were used to control the following insects: Green apple aphid (*Aphis pomi*), rosy aphid (*A. sorbi*), grain aphid (*A. avenae*), woolly aphid (*Eriosoma lanigera*), apple leafhoppers (*Empoasca rosae* and *E. unicolor*), apple redbug (*Lygidea mendax*), pear psylla (*Psylla pyricola*), currant aphid (*Myzus ribis*), four-lined leaf bug (*Poecilopsus lineatus*) and the potato aphid (*Macrosiphum solanifolii*). The applications were made with hand blowers or large power outfits. A mixt. contg. 90% superfine S and 10% powdered Pb arsenate was used as a carrier for the nicotine. Nicotine applied in this way was toxic to apple aphids, redbugs, leafhoppers, currant aphids and four-lined leafbugs. Dusts contg. 0.5% nicotine were more resistant, 2% being required for the fatal dose. Potato aphids also required 2% nicotine for effective control. Nymphs of the pear psylla were fairly resistant to dusts contg. 0.5-2% nicotine. Air currents, denseness of tree growth, low temp. and the exudates of insects had, at times, a marked influence on the effectiveness of dust mixts., rendering the technic of orchard dusting different in many particulars from spraying. The pear psylla and woolly aphid were protected by their exudates of honey dew or wax. During periods of low-temp. dusting was less effective than when high temps. prevailed. Dusting for the control of insects is still in the exptl. stage. While the speed of operation and economy of labor recommend it, there are still many unsolved problems in dusting-machinery construction, and opportunity for cheaper and more efficient dust mixts.

CHAS. H. RICHARDSON

Dusting as a means of controlling injurious insects. THOMAS J. HEADLEE. Agr. Expt. Sta., New Brunswick, N. J. *J. Econ. Entomology* 14, 214-20(1921).—Dusts composed of S, Pb arsenate and Ca(OH)₂ were practically equiv. in efficiency to spray mixts. contg. self-boiled lime-S and Pb arsenate for the control of curculio and fungous diseases of peach. They were inferior, however, to the spray mixt. for the control of curculio and codling moth on apple under New Jersey conditions. The rainfall during the summer season renders the dust less effective than the spray. S-Pb arsenate dust impregnated with nicotine gave good control of apple aphids, but was not quite as effective as the liquid nicotine spray.

CHAS. H. RICHARDSON

Dusting versus spraying of apples. A. L. QUAINANCE. Bur. of Entomology, Wash. *J. Econ. Entomology* 14, 220-5(1921).—This is a summary of expts. in orchard dusting carried on in Michigan, Virginia, Arkansas, Connecticut and Colorado, 1915-1918. In the northern states where the codling moth is not especially severe arsenical dusts control this insect practically as well as arsenical sprays; in regions where the codling moth is more abundant dusting does not give satisfactory control. Curculio

on apple is controlled by dusting when not abundant, but when abundant, dusts give poor control and sprays may not give the protection desired. Fungous diseases are not adequately controlled by dusting. Some data are given on the control of curculio and fungous diseases on peach by means of dusts. During av. abundance and av. weather conditions, dusting is about as effective as spraying for the control of these pests of peach in Georgia and Mississippi, but a hot, rainy summer may bring a heavy loss of fruit, through insect and plant disease damage, in spite of thorough dusting and spraying.

CHAS. H. RICHARDSON

Orchard dusting versus spraying. N. J. GIDDINGS. Morgantown, W. Va. *J. Econ. Entomology* **14**, 225-30(1921).—A number of Cu-lime, S-arsenate, and S-lime sulfur dust combinations were used for the control of fungous diseases of apple. The S-lime sulfur dust (S 75%, lime sulfur 15%, Pb arsenate 10%) gave promising results. S dust was effective for the control of peach scab with a negligible amt. of foliage injury. A general discussion of the dusting problem in relation to the control of fungous diseases is given and following this a further discussion by a number of entomologists and plant pathologists.

CHAS. H. RICHARDSON

Arsenic for grub-infested soils. J. F. ILLINGWORTH. Gordonvale, North Queensland. *J. Econ. Entomology* **14**, 238-9(1921).—Arsenious acid when mixed in the soil to the amt. of 80 lbs. per acre was effective for the destruction of the larvae of *Isodon puncticollis* which feed on the roots of cucumbers. The poison had no detrimental effect on the plants even in amts. as large as 200 lbs. per acre. In small lab. expts. As_2O_3 readily killed white grubs destructive to sugar cane. Large scale expts. are now under way.

CHAS. H. RICHARDSON

The feeding habits and chemical sense of *Nereis virens* Sars. ALFRED O. GROSS. Bowdoin Coll. Me. *J. Exptl. Zool.* **32**, 427-42(1921).—This worm feeds chiefly upon marine plants, but the sense of taste or a chem. sense plays a small part, if any, in the location or selection of food. *Nereis* is strongly negatively chemotropic to acids (HCl), bases (KOH, NaOH) and salts (KCl, NaCl, NH_4Cl). It reacts more strongly to KCl than to NaCl, the reverse being true of the earthworm. This behavior is correlated with the high concn. of NaCl in the sea water in which *Nereis* lives. Although the entire integument responds to chem. stimulation, the chem. sense is concd. in the palps and tentacles. There are no special taste buds for the reception of chem. stimuli.

CHAS. H. RICHARDSON

The natural history of *Onchidium*. LESLIE B. ARRY AND W. J. CROZIER. Northwestern Univ. and Univ. Chicago. *J. Exptl. Zool.* **32**, 443-502(1921).—This paper records the results of lab. and field studies on the pulmonate mollusk, *Onchidium floridanum*. The habits are described, also the effects of mechanical, photic, thermal and chem. stimulation. The origin of the animal, heliotropism and the analysis of conduct, rhythms of behavior and the comparative physiology of homing movements are discussed. The considerations of special chem. interest are the effects of chem. stimulation. Small amts. of rain water, maltose, lactose or sucrose in 1 M solns. did not induce responses. Sea water concd. to $\frac{1}{2}$ its original vol. caused contractile movements when applied to the head and lips; sea water with its osmotic pressure increased by the addition of 0.5 M glycerol induced slight reactions when applied to the lip region. Various alkaloids, anesthetics, alcohols, acids, alkalis, salts, H_2O_2 and certain essential oils were much more powerful activating agents. The entire surface of *Onchidium* is open to sensory stimulation by various compds. in dil. soln. In this respect, this animal resembles other marine invertebrates. (Cf. C. A. **14**, 3476.) Low concns. of electrolytes were more effective on the dorsal mantle and mouth region than on the foot. NaCl and $LiCl$ brought forth an explosive discharge of the repugnatorial glands, while KCl and NH_4Cl usually did not. The foot was least responsive to ionic stimulation; with the cations stimulation took place in the following order: $Na > Li > K > NH_4$. This order was

practically the reverse of that found in some other mollusks. (Cf. C. A. 14, 3476, 3477.) The order for the anions tested was: $I > Cl > NO_3 > Br$, similar to what has commonly been reported. Evidence is given for the belief that this animal contains receptors for general irritating activation which are distinct from chemoreceptors proper. Thus some substances like MeOH and EtOH at 5 M concns. cause a discharge of the repugnatorial glands whereas amyl alcohol, which produces vigorous responses of the animal in general, does not cause these glands to discharge. The same was true of chloretone and urea. No selective activity in regard to food was observed. C. H. R.

An experimental study of the tarsal chemoreceptors of two nymphalid butterflies. DWIGHT E. MINNICH. Syracuse Univ. *J. Exptl. Zool.* 33, 173-203(1921).—*Pyramis alalanta* and *Vanessa antiopa* responded to the distant chem. stimuli afforded by apple juice (i. e. the volatile constituents) by uncoiling the proboscis. When the tarsi of the second pair of legs were brought into contact with apple juice, many individuals which failed to react to distant chem. stimuli now responded by uncoiling the proboscis. Positive responses were also obtained with distd. water, but they were quantitatively fewer than when a food substance was concerned. By detg. the % of responses to various substances, it was shown that the tarsal sense organs concerned in these responses were neither temp., tactile, nor osmotic organs, but chem. organs, which function only through intimate contact with the stimulating material. These organs are present in *Pyramis* and probably also in *Vanessa* in the last 4 tarsal segments of the walking legs. *Pyramis* can distinguish a 1M sucrose soln. from distd. water, and a 1M HCl, M/600 quinine sulfate, or 1M NaCl soln. from either distd. water or sucrose soln. The response to a given soln. may vary widely from day to day, undoubtedly due to changing physiol. states in the insects. Removal of the antennae, labial palpi and rudimentary fore legs in *Pyramis* does not affect the responses produced when the tarsi are subjected to chem. stimulation. These tarsal chemoreceptors are important to the insect in the detection of food and water; they appear to function like organs of taste. C. H. R.

Oxygen supply of certain animals living in water containing no dissolved oxygen. ARTH E. COLE. Univ. Wisconsin. *J. Exptl. Zool.* 33, 293-320(1921).—The animals used were principally larvae of *Chironomus tentans*; some observations were also made upon a small clam, *Pisidium idahoense*, an annelid, *Limnodrilus* sp? and the insect, *Sialis infumata*. These and some other forms of animals live in the deeper parts of Lake Mendota, Wis., although during a part of the year the water in which they are found contains no dissolved O. Chironomid larvae are active during the time that O is absent in the water surrounding them. They are probably not facultative anaerobes since they readily succumb to low concns. of KCN. Although the incomplete breakdown of food materials in the body of the larvae when O is absent, offers a possible source of energy, it is not a probable source. The blood of chironomid larvae contains hemoglobin, but it cannot store O for long periods. Larval blood or an aq. ext. of larval tissues contains an enzyme-like substance which oxidizes alc. tincture of guaiacum on the addition of H_2O_2 or old turpentine. Boiling does not destroy this substance, in which respect it differs from true enzymes. Iron seems to play an important role in its thermostability. No peroxides are present either in the blood, or soft tissues of chironomid larvae. However, a true thermolabile enzyme was found in the chitin which would oxidize guaiacum without the addition of a peroxide. If the chitin prepn. is first heated before the guaiacum soln. is added, no blue color develops until H_2O_2 is added. "These results indicate that a true thermolabile enzyme builds up a peroxide from which at O is being split off by the action of an enzyme-like substance which is not killed by boiling." A peculiar feature of the reaction of this enzyme complex was that while alc. tincture of guaiacum gave the reaction, benzidine, α -naphthol and β -phenylenediamine-HCl did not. Other similar instances in the literature are given. Whether the production of an agent capable of oxidizing guaiacum is dependent upon the pres-

ence of mol. O remains to be proved. Expts. showed that the plant debris of the mud in which the chironomid larvae live (in the absence of dissolved O_2) possessed the power to oxidize guaiacum and benzidine. This oxidizing material was constantly being produced by the plant debris. It is believed that the oxidizing material concerned is at. O, the amt. of which liberated at any one time is small. It is probably the source of O for the animals living in Lake Mendota in water contg. no dissolved O. *Pisidium* does not contain an enzyme capable of oxidizing guaiacum without the presence of H_2O_2 ; a thermostable peroxidase-like substance which is capable of liberating at. O from a peroxide is, however, present. The clam is inactive during the period of O scarcity and probably, like the chironomid larvae, obtains its O from the plant debris. *Limnodrilus* has a similar enzyme equipment. The larva of *Sialis* possesses little of the peroxidase-like substance; in the chitin, however, there is a thermolabile enzyme-like complex, but its oxidizing power towards guaiacum is weaker than that found in the chironomid larvae. The methods used in obtaining samples of lake water, in making water O-free, and the use of the indicators, guaiacum, benzidine etc., are described. C. H. R.

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Stabilizing world's food supply. G. ANDERSON ORB. *Tea and Coffee Trade J.* 40, 720-4(1921).—A discussion of dehydrated foods. C. W. TRIGG

Problems of alimentation and scientific methods of solving them. C. D. ANDRADE. *Bol. lab. municipal, Guayaquil* 1, 25-31(1920).—In connection with a study of vitamins a lack of a proper standard for rice consumed by the people of Ecuador was noted. In the absence of a method for detg. quantitatively the vitamins present in rice the percentage of P present, expressed as P_2O_5 , is taken as a measure of its quality. A minimum of 0.4% P_2O_5 is the standard set in the Philippine Islands. With this in view analysis was made of samples obtained in the open market, with a variation of P_2O_5 from 0.316 to 0.515% in 10 samples. Analysis of 2 samples of known origin and hand cleaned and ground gave 0.594 and 0.639% P_2O_5 . 2 samples of rice obtained from local mills contained the following amts. of P_2O_5 : hand cleaned in the lab., "A" 0.585, "B" 0.621; polished and hulled at the mill, "A" 0.394, "B" 0.434; rice bran, "A" 0.118, "B" 0.124%. It is pointed out that unpolished rice is more easily attacked by insects, but this may be prevented by placing small bottles of $CHCl_3$ or CCl_4 in the warehouses where the rice is stored. The real difficulty arises in inducing the people to use the unpolished rice. R. B. DEEMER

The available carbohydrate in thrice boiled vegetables. LORETTO O'REILLY AND EDITH H. McCABE. Royal Victoria Hosp., Montreal. *J. Biol. Chem.* 46, 83-9(1921).—The vegetables investigated were placed in a one thickness cheese-cloth bag and boiled for 3 periods of $\frac{1}{2}$ hr. each in an open kettle, fresh cold H_2O being used for each period. It is not possible to free any vegetable completely from carbohydrate by boiling with 1 l. of H_2O per 100 g. of material but this can be accomplished in the case of lettuce, celery and vegetable marrow when 20 parts of H_2O are used. Canned spinach and asparagus, turnips, beets and onions can be rendered approx. carbohydrate-free by the latter procedure. Cauliflower, pumpkin, cabbage, carrots and canned string beans retain about 0.5% of available carbohydrate. With most vegetables addition of $NaHCO_3$ in 0.05 and 0.1% concn. favors the completeness of extn., this being especially marked in the case of cauliflower. When 0.05% $NaHCO_3$ was used the vegetables were uniformly softer in consistency, more closely approached their natural color and in no instance were objectionable. With 0.1% they were frequently of a brown color and of too soft consistency; this was most noticeable in the case of

onions and cauliflower. In the case of squash and parsnips it was not possible to reduce the carbohydrate below 2.26 and 2.36%, resp.

A. P. LOTHROP

The determination of carbohydrates in vegetable foods. VICTOR C. MYERS AND HILDA M. CROLL. N. Y. Post-Graduate Med. School and Hosp. *J. Biol. Chem.* **46**, 537-51 (1921).—*Detn. of free sol. sugars.*—Grind the edible portion of the fruit or vegetable finely in a food chopper and mix thoroughly. Weigh 2 or more samples accurately into beakers, transfer to a mortar, grind thoroughly with sand and finally with a measured vol. of H_2O until all the sol. carbohydrate has been extd. The following proportions are convenient: 1-5% of carbohydrate, 6-3 g. of sample and 100 cc. of H_2O ; 6-10%, 3-2 g. and 200 cc.; 15 or more %, 3 g. and 100 cc. with diln. of filtrate to 1 to 5, or 10 if necessary. Sat. a portion of this cool mixt. with dry purified picric acid and filter. Measure 3 cc. of the clear filtrate into each of two tall glass test-tubes (sugar tubes) graduated to 3, 4, 10, 15, and 20 cc. To the first tube add 1 cc. of 22% Na_2CO_3 soln., immerse both tubes in a boiling water bath and after 10 min. add 1 cc. of 22% Na_2CO_3 soln. to the 2nd tube. Heat both tubes for 20 min., cool, and dil. to 10, 15 or 20 cc. (or more) to match the standard approx. and compare with the standard in a Bock-Benedict colorimeter. Use a 0.02% soln. of pure glucose in satd. picric acid soln. as the standard. Heat 3 cc. of this soln. with 1 cc. of 22% Na_2CO_3 for 20 min. in a boiling water bath, cool, dil. to 10 cc. and set at 15 mm. in the colorimeter. Any increase of reducing sugar after hydrolysis of the filtrate with picric acid represents the non-reducing sol. sugar (sucrose) present in the sample. Calcn. Diln. of unknown/diln. of standard \times reading of standard/reading of unknown $\times 0.0006/3 \times V/W = \%$ of sugar in sample. $V =$ vol. of H_2O added to sample plus vol. of H_2O contained in sample (from actual detn. or using av. recorded value); $W =$ wt. of sample. *Detn. of total available carbohydrate.*—Weigh a sample of the vegetable into a small-necked Florence flask of 300 cc. capacity, calibrated to a mark on the neck. The following wts. of samples are satisfactory: 1-5% of carbohydrate, 15-5 g.; 6-10%, 5-2 g.; 15 or more %, 5-4 g. Add about 100 cc. of H_2O and boil for 1½ hrs. under a reflux condenser. Grind to a paste in a mortar, rinse back quantitatively into the flask with the mother liquor and with H_2O until the vol. is about 150-200 cc. Stopper the flask with cotton, heat to boiling, cool to 40°, and add 5 cc. of a 1% soln. of "taka-diastase" (Parke, Davis and Co.) and a few cc. of C_2H_5 . Shake, stopper with cotton, and allow to stand 18-20 hrs. in an incubator at 35-7°. Cool and make up to the mark with cold H_2O . Shake thoroughly and filter a portion of the liquid. Pipet 20 cc. of the filtrate (10 cc. of the % of carbohydrate is over 10%) into a large test-tube calibrated to a 25 cc. mark, and add 1.4 cc. of concd. HCl (34%) to give an acid concn. of about 0.6 N . Place a small funnel in the top of the test-tube to serve as a condenser and heat in a boiling water bath for 1-2 hrs., thus changing the dextrin and maltose formed from the starch by diastase into simple reducing sugar. Cool, almost neutralize with concd. $NaOH$ soln., make up to the 25 cc. mark and sat. with dry picric acid. Measure 3 cc. portions into sugar test-tubes and develop the color on heating with 1 cc. of 22% Na_2CO_3 soln. as described above for free sol. sugars. The % of reducing sugar found represents the total available carbohydrate in the sample. In the calcn. make allowance for the reducing sugar in the "taka-diastase" which must be detd. separately in the above manner for each 1% soln. prepd. After acid hydrolysis for 1 hr. this is usually found to be about 0.5-0.7%. A soln. may be kept active for at least a week if preserved with C_2H_5 in a refrigerator. The following % of total sugar (reducing and non-reducing) have been found in those fruits and vegetables most used in feeding diabetic patients, the methods described being used. Asparagus 1.21, lima beans 1.55, celery hearts 1.94, celery outside portion 0.56, lettuce mixed head 2.21, cauliflower 2.1-2.9, cucumber av. 3.39, radish av. 3.39, green string beans 3.43, tomato 3.47, cabbage 3.22-4.16, squash 5.0, peas 5.49, carrots 7.5, onions 8.3, lemon 1.97, lemon juice, 1.97, strawberry 4.1, grape-

fruit 8.63, Florida orange 9.58, Cal. orange 14.2, orange juice 6.78, pear 11.9, apple 11.1-14.0, tangerine 13.65, banana very green 1.75, medium ripe 15.4, very ripe 18.18, Malaga grapes 22.5. The amt. of sol. sugars for most of the fruits and vegetables compares well with the amt. of total carbohydrate minus fiber in the recorded figures, indicating that the % of starch is small in fruits and many of the vegetables. Potatoes, peas and lima beans contain a large proportion of starch as compared with sol. sugars. The ordinary method of boiling vegetables for a minimum time and with a small amt. of H_2O removes 23-66% of the carbohydrate. In thrice cooked vegetables where the proportion of boiling water to vegetable is relatively large, 11.6-38% of the carbohydrate is retained. The greater the proportion of H_2O used and the longer the time of boiling, the greater is the loss of carbohydrate in the boiling process, and the greatest loss occurs in those vegetables in which most of the carbohydrate is present in a sol. form.

A. P. LOTHROP

Ice cream as a food. M. E. JAFFA. U. of Calif. *Milk Plant Mo.* 10, No. 5, 70-76 (1921).—J. discusses the food value of ice cream from the standpoint of the energy relations of the constituents. Benedict's data from "Energy Content of Extra Foods" (cf. C. A. 12, 2387) is cited in deducing values for the various types of ice cream and related products. The value of the salts and vitamins in ice cream are discussed.

H. F. ZOLLER

The sporogenes test for the cleanliness of milk. S. H. AYERS AND P. W. CLEMMER. U. S. Dept. Agr., *Bull.* 940.—It was found that 20-cc. portions of milk instead of 2-cc. gave more reliable results if held for 24 hrs. at 37° in the above test to milk to indicate its cleanliness. The spores of this organism are said to withstand the influence of customary pasteurization and hence the test may be applied to market milk to indicate roughly manual contamination. While the majority of the spores undoubtedly come from manure, yet there seems to be no direct correlation between the results and the quantity of contamination. The use of gentian violet, alkali albuminate, and peptone to augment the test was studied by the above authors; they were not found to be beneficial.

H. F. ZOLLER

The hygienic control of milk by means of biochemical analysis. L. E. TAMAYO. *Bol. lab. municipal, Guayaquil* 1, 36-9 (1920).—T. proposes the use of well known biochem. methods of analysis for the examn. of the milk supply of Guayaquil as a substitute for bacteriol. examn. and gives the results of the analysis of the local milk supply.

R. B. DEEMER

Rapid acidity test for grading milk. ROSCOE H. SHAW. *J. Dairy Sci.* 4, 91-4 (1921).—Milk measured by a small brass cylinder (15-20 cc.) is poured into a white enamelled vessel, an equal quantity of NaOH measured with another cylinder is added and alkalinity to phenolphthalein (1% in alc.) is detd. The alkali is made so that an acidity of 0.2% or over will show no pink; 50 cc. of stock soln. (17.777 g. NaOH per l.) is made to 1 liter.

H. A. LEPPER

Alcohol test for grading milk in condenseries. A. O. DAHLBERG AND H. S. GARNER. U. S. Dept. Agr., *Bull.* 944, 1-13 pp (1921).—Of 90 samples of raw milk investigated 46 showed curdiness after sterilizing and shaking and 44 showed no curdiness under the same conditions. The alc. test would have rejected 43 of the 46, while the acid test would have rejected 18 of the 46 as well as 21 of the 44. The alc. test as applied consisted in adding to a given vol. of milk a like vol. of 75% EtOH. Formation of a curd generally indicated that the milk would not "stand up" under the sterilizing conditions employed at this factory.

H. F. ZOLLER

Hoyberg's method for the determination of fats in milk and cream. A. C. ANDERSEN. *Rept. Kgl. Vet. and Landbohøjskoles Lab. for Landekon. Forsøg*, 105, 1-36.—A. concludes (a) Hoyberg's method is as accurate as Gerber's for the detn. of fats in milk; (b) Hoyberg's method is a little more difficult to manipulate; (c) in cream analysis

H.'s method gives too high results. The advantages are those already pointed out by Hoyberg.

G. E. HOLM

Factors influencing the nutritive value of lard and lard substitutes. J. C. DRUMMOND. *J. Soc. Chem. Ind.* **40**, 81-4T(1921).—Early investigations on the vitamin A content of lard, beef fat and vegetable oils have led to the belief that this valuable growth-promoting substance is absent from these products. Using the biochem. method (C. A. **15**, 252) with rats D. has shown that the nutritive value of lards and lard substitutes may be largely detd. by the amt. of vitamin A present. The diet of the pig is the chief factor detg. the amt. of this substance present in the body fat. If fed on materials contg. little vitamin A the animal uses all he obtains for his own growth and stores little or none in his body tissues. In the manuf. of lard from fat rich in vitamin A, avoidance of aeration or oxidation at high temps. will prevent loss of this active substance. The vitamin content of beef fat is dependent on the diet of the animal. In the manuf. of oleo-stearin from premier jus the vitamin passes through the lower m. p. fractions into the oleo oil. Samples of hydrogenated fats of animal and vegetable origin and compound lards are usually devoid of appreciable amts. of vitamin A. Discussion of the paper brought out the fact that whale and other marine animal fats contain vitamin A but that these are destroyed in the process of hardening. It was suggested that the food of marine animals and fishes, "plankton," must be very rich in vitamins and D. stated that an expedition to study this point is to go to Norway this summer.

H. S. BAILEY

Acidity and quality (in butter). F. W. BOUSKA. *J. Dairy Sci.* **4**, 105-13(1921).—A discussion of the effect of the acidity of the cream on the quality of the butter and the corrective value of neutralization with lime. Proper procedure for the use of lime is suggested.

H. A. LEPPER

Investigations on the rancidity of butter and margarine fats. W. N. STOKOE. *J. Soc. Chem. Ind.* **40**, 76-81T(1921).—The rancidity of pure fats is now generally understood to be due to a product of hydrolysis and oxidation. Although usually accompanied by acidity this is in no way a measure of rancidity. In com. oils rancidity seems to be caused by the action of moisture, air, and light assisted by traces of lipolytic enzymes. It has been thought that microorganisms are the cause of rancidity, but in pure fats this is not the case, for when introduced into the fat they quickly die. Pure oils such as coconut, lard, soy-bean, etc., were inoculated with *Penicillium glaucum* and incubated for 2 weeks. At the end of this time all the samples were sweet and none had increased appreciably in acidity. The rancidity of butter and margarine is almost wholly caused by microorganisms. The forms of rancidity may be classified by the appearance, odor and taste. Samples with a stale, greasy taste and odor, but not discolored, such as "tallowy butter," are probably the result of oxidation rather than of microorganisms. The "perfume" form of rancidity in which a strong aromatic odor occurs was proved, by inoculating coconut, palm kernel and other fats, to be due to *Penicillium* and *Aspergillus*. The "perfume" odor is not produced in butter fats by these organisms; neither will *Oidium lactis*, which liquefies fats, give the odor in coconut or any other fat investigated. The effect was studied of other organisms and various nutrients such as gelatin, dextrose, milk, casein and sugar on margarines and butter. Cuts of the growth produced and a complete discussion of these different factors are given. In conclusion S. points out the necessity for thorough cleanliness in butter and margarine factories and suggests the value of sterilization of materials and equipment. It should be noted, however, that temps. of even 170° for several hours will not kill all the spores in badly contaminated oils.

H. S. BAILEY

The detection of adulteration in butter by means of the melting point of the insoluble volatile acids. GEO. VAN B. GILMOUR. *Analyst* **46**, 183-7(1921).—The insol. volatile fatty acids of 12 butters, and various mixts. of butters and coconut and palm-

kernal oils were prepd. by the Blichfeldt method [*C. A.* 4, 2747; 14, 131 (page reference in abstract here referred to should read "150-2T" instead of "105-2T" as given)]. The m. ps. of these acids were detd. by the method of Blichfeldt and Thornley (*C. A.* 15, 2557). From the data obtained and curves in which the m. ps. of the mixts. of butter and other fats were plotted against their percentage compn. the following conclusions are drawn. The detn. of the m. p. of the insol. volatile acids is a useful confirmatory test in the analysis of butter fat. When the m. p. and the % of total volatile acids are considered together these 2 factors should give sufficient evidence of the purity of the sample. The m. ps. of pure butter lie between 15.8° and 25.6°; genuine butters give m. ps. above 15.8° but if the total volatile figure falls below 28, the m. p. should be above 20.0°. Often the m. p. will show adulteration when distn. methods fail. The addition of either coconut or palm kernel fats to butter causes a lowering of the m. p. of the insol. volatile acids. This m. p. method will detect 10% of added coconut or palm kernel fat and give suspicious indications with even small quantities.

H. S. BAILEY

Past experiences in the process of ripening of cheese. ORLA-JENSEN. *Maelk. Tid.* 8, 87-94(1921).—A lecture upon the chem. and bacteriological processes involved in the ripening processes of various types of cheese.

G. E. HOLM

The control of the acidity of brine baths. N. THOLSTRUP PEDERSEN. *Maelk. Tid.* 10, 127-30(1921).—The use and regulation of the conditions of brine baths used in cheese factories are discussed.

G. E. HOLM

Oil extract of lemon. ROE E. REMINGTON. *The Spice Mill* 44, 1048-9(1921).—Comparison of the optical activity of alc. and cottonseed oil solns. of lemon oil were made. In taking polariscope readings of lemon oil exts. in a 100-mm. tube a factor (rotation ÷ % lemon oil) of 1.75 should be used for cottonseed oil exts. instead of 1.6 as for alc. exts. When the two exts. were used in baking cakes little difference could be detected in the resultant products.

C. W. TRIGG

A new lead number determination in vanilla extracts. H. J. WICHMANN. *J. Ind. Eng. Chem.* 13, 414-8(1921).—A new Pb no. detn. is proposed wherein the de-alcoholization and long standing of the Winton method is dispensed with and the pptn. equil. is established by boiling. Results by this method are approx. $\frac{1}{2}$ higher than by the Winton method. Pb nos. on adulterated exts. were abnormal, and not caused by sugar, glycerol or coumarin. Reinforcement of exts., especially dil. ones with vanillin, causes high values. A modification removing the excess vanillin is proposed. The new method is accurate, quick, reliable and represents a complete reaction obviating all uncertain or variable colloidal phenomena.

H. A. LEPPER

The mineral constituents of potatoes and potato flour; effect of process of manufacture on composition of the ash of potato flour. C. E. MANGELS. *J. Ind. Eng. Chem.* 13, 418-9(1921).—Comparison is made in tables of results of the usual detns. in food analysis and of CaO, MgO, K₂O, P₂O₅, S and Cl₂ detns. on potatoes, potato flour from peeled potatoes, bolted, and flour from unpeeled potatoes, unbolted. Mineral constituents vary in different samples of potatoes. Flour contains a smaller relative amt. of total ash and a very slightly smaller amt. of K₂O than the corresponding fresh potato. The "hot drum" process does not appreciably change the relative distribution of different mineral constituents and the nutritive value of flour with respect to these constituents is practically the same as that of fresh vegetable.

H. A. LEPPER

The almond—its food value, cultivation and marketing. ANON. *The Spice Mill* 44, 1084, 1086-9(1921).

C. W. TRIGG

The cultivation of beans in Burma and Assam. ANON. *Bull. Imp. Inst.* 18, 471-8(1920).—Five samples of Madagascar beans (*Phaseolus lunatus*) gave the v. wt. of 100 beans amts. varying from 63.2 to 102.4 g. and contained from 0.003 to 0.0045% HCN. The "rice" bean (*Phaseolus calcaratus*) contained: moisture 9.0 to 10.6%, crude

proteins 20.8 to 25.3%, fat 0.5 to 1.0%, carbohydrates 54.7 to 60.3%, fiber 4.9 to 5.4%, ash 3.8 to 4.6%, food units 113 to 119, HCN *nil*. These all have a high % of protein and would have a good feeding value. Four samples of colored Rangoon beans contained moisture 9.8 to 10.3%, crude proteins 20.2 to 22.2%, fat 0.8 to 1.7%, carbohydrates 58.3 to 59.3%, fiber 4.6 to 5.2%, ash 3.1 to 4.0%, food units 113 to 116, HCN 0.045 to 0.050%. In the raw state these might be dangerous to live stock. R. L. SIBLEY

A note on the carbohydrates of the root of the cat-tail (*Typha latifolia*). ZALIA JENCKS. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 45-6(1919).—The root of the cat-tail has been recommended recently as a valuable food for man. An analysis indicates that it contains 81% of carbohydrates. J. has sepd. the most abundant carbohydrate of the root and found that it gives a blue color with I, forms a characteristic paste with hot H₂O, is readily digested (in contrast with inulin) by saliva, and yields on hydrolysis a dextrorotatory soln. from which an osazone, identical with glucosazone, was prepd. It thus corresponds with starch. The "flour" was found to contain 56.8% carbohydrate. Mice were fed for a week on otherwise adequate diets containing 30% of the "flour" without evident untoward results. The animals gained in wt. upon the ration. V. C. MYERS

Ground coffee and its analysis. G. S. PONCE AND J. R. PALMA. *Bol. lab. municipal, Guayaquil* 1, 65(1920).—Moisture, detd. at 100°, ash, and org. matter are reported for 24 samples of ground coffee of known origin. H₂O, max. 11.91, minimum 9.04%; ash, max. 6.66, minimum 4.92%; org. matter, max. 84.87, minimum 82.05%. R. B. DEEMER

The density of the aqueous extract of native coffee. J. R. PALMA AND G. S. PONCE. *Bol. lab. municipal, Guayaquil* 1, 32-33(1920).—Ten g. of ground coffee is boiled for a period of 5 mins. in 100 cc. distd. H₂O, the time of boiling being counted from the appearance of the first bubbles through the liquid. The ext. is cooked for a short period and filtered, and the d. is detd. by a pycnometer. Twenty five samples of pure coffee gave a d. ranging from 1.0091 to 1.0077. Temp. is not given. R. B. DEEMER

South American "tea." CHARLES W. TRIGG. *Tea and Coffee Trade J.* 40, 739-40 (1921).—Cultivation, compn. and physiological effects of maté are briefly discussed. Attention is called to its increased use as a soft drink base. C. W. T.

Possible loss of protein during the drying of beet leaves. H. WAGNER. III. *Landw. Z.* 40, 441; *Z. Ver. deut. Zuckerind.* 71, 251(1921).—The drying expts. were made with leaves from fodder beets, sweet fodder beets, and sugar beets, at 60 and at 105-110°. Neither crude protein nor pure protein were found to be measurably affected by drying, but the digestible part of both decreased considerably, more so at the higher temp. Care must be taken in drying beet leaves that the air or gas used is not too hot when it comes in contact with the leaves, and the latter must be kept constantly in motion. F. W. ZERBAN

Feeding value of the pods and seeds of *Prosopis stephaniana*. ANON. *Bull. Imp. Inst.* 18, 478-9(1920).—Analysis of the pod cases only of this leguminous shrub gave: moisture 10.4%, crude proteins 10.4%, fat 2.5%, carbohydrates 56.2%, fiber 17.0%, ash 3.5%, food units 89. The seeds only contained: moisture 9.5%, crude proteins 118.2%, fat 2.8%, carbohydrates 58%, fiber 8.4%, ash 3.1%, food units 111. No alkaloids or cyanogenetic glucosides were detected. The pods contained 3.8% sugar but no tannin. Their value as a feeding stuff is impaired by the highly fibrous nature of the pods and the hardness of the seed coat. R. L. SIBLEY

Cooking and vitamins (DELF) 11E. Vitamines and yeast growth (WILLIAMS) 11B. Study of lactose-fermenting yeast in cream (HAMMER, CORDES) 11C. Utilization of perilla seed (ANON) 27. Botulism from cheese (NEVIN) 11G.

CHALOT, C. AND BERNARD, U.: **Culture and Preparation of Vanilla**. Paris: Émile Larose. 219 pp. For review see *Expt. Sta. Record* **44**, 237(1921).

DECHAMBRE, P.: **Oil Cakes in Animal Feeding**. Paris: Augustin Challamel. 64 pp. For review see *Expt. Sta. Record* **44**, 363(1921).

KREIS, H.: **Bericht über die Lebensmittelkontrolle im Kanton Basel-Stadt während des Jahres 1920**. Basel: Buchdruckerei Witwer and Co. For review see *Z. öffentl. Chem.* **27**, 118(1921).

WHYMPER, R.: **Cocoa and Chocolate: Their Chemistry and Manufacture**. 2nd Ed. revized and enlarged. Philadelphia: P. Blakiston's Son and Co. 568 pp. \$10.00.

Vegetable gelatin. M. M. MALCOLM and C. S. TOWNSEND. *Brit.* 161,812, Nov. 10, 1919. Vegetable gelatin is extd. from seaweed, especially carragheen, by first softening and cleaning the material in hot or cold water, than heating it with water containing a small quantity of an acid, such as HOAc, a salt or an alkali, in order to break down the vegetable tissue, and after running off the liquor, adding the liquor obtained by subjecting the residue to pressure, and finally filtering the amalgamated liquors and evap. them to dryness. The seaweed may be bleached before the breaking-down treatment; and a preservative, such as NaHSO₃ or NaOBr, may be added before evapn. The evapn. of the liquid may take place on trays, on heated rollers, or by spraying into a current of hot air. The product is of use as a food.

Coffee extracts. A. CHALAS. *Brit.* 161,920, Apr. 15, 1921. An infusion of roasted coffee is concd. at or near 0° in a high vacuum and the concd. ext. dried either by the circulation of air, or *in vacuo* with the aid of absorbents, such as concd. H₂SO₄ or ZnCl₂ or CaCl₂. The concn. may be effected on the surface of rotary disks or drums dipping into the liquid. Heat is supplied by H₂O circulating through the hollow shafts of the disks or drums, and the concd. liquid removed by scrapers. Small quantities of lactose and dextrin may be added to the dried product. The product may be added to cacao butter, etc. The ext. may be frozen and allowed to evap. as solid *in vacuo*.

13—GENERAL INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING

HARLAN S. MINER

Report of the [British] government chemist upon the work of the government laboratory for the year ended March 31, 1920, with appendices. H. M. STATIONERY OFFICE *Analyst* **45**, 464-7(1920).—The total number of samples examd. during the year was 368,898. H. G.

Utilization of waste in the chemical industry. B. WAESER. *Chem. Ztg.* **45**, 453-7(1921).—A plea for the max. utilization of materials and energy, with numerous illustrations of progress made, statistical data concerning savings effected, and a short bibliography. W. C. EBAUGH

Survey of chemical engineering education. A. D. LITTLE, ET AL. *Chem. Met. Eng.* **24**, 1047-53(1921).—A summary is given of the results of a questionnaire, showing the curriculums of 78 institutions. E. H.

Strength and insulating values of various materials. ANON. *Elec. Rev.* **78**, 990(1921).—A tabulation of the dielec. strength and tensile strength of varnished materials, such as cambric, canvas, paper and silk. G. G. F.

Recovery of volatile solvents by the Bregat process. M. ROULLUX AND ROBERT G. DORT. *Chem. Met. Eng.* **24**, 916-21(1921).—In treating a gaseous mixt. contg.

a solvent with a liquid absorbent crude phenols, especially cresols, show a high ratio between the concn. of solvent in the liquid phase (*i. e.*, in the absorbent) and the concn. in the gaseous phase when the system is in equil., and are, therefore, very efficient. Unlike H_2SO_4 , used as an absorbent, cresols do not undergo changes with the substances used, do not require app. of non-corroding material, and are influenced but little by water vapor. When the concn. of vapor undergoing absorption falls off there is an appreciable lag or hysteresis in the liberation of dissolved material from cresols, thus preventing a loss. This accounts for the value of the Bregat solvent. A mol. complex, easily broken down by heat, rather than simple soln., is probably formed, and this accounts for the lag. As the vapor tension of cresol at ordinary temps. is very low the loss of absorbent in escaping air is small. At 150° , however, cresols lose all their absorbed solvents, yielding them in about the same proportions as they existed originally in the gases undergoing treatment. A diagrammatic representation of app. and flow sheet, and results of com. installations, especially for the recovery of alc.-ether mixts., are given, and the claim is made that the success obtained in France and England in specified industries warrants a wider application of the Bregat process.

W. C. EBAUGH

The handling of barrels and other wooden containers. K. ROBAX. *Farben-Zig.* 26, 1570-1, 1635-6(1921).—R. gives methods for cleaning barrels which contained various substances, formulas for sizing interior surfaces, and barrel paints, etc.

F. A. WERTZ

Keeping lubricating oil in good condition. C. H. BROMLEY. *Gen. Elec. Rev.* 24, 414-21(1921).

C. G. F.

Lubricating oils suitable for use in Diesel engine air compressors. ANON. *Petroleum World* 18, 242(1921).—A discussion at a meeting of the Diesel Engine Users Assoc. resulted in a decision that the lubricating oil used in the air compressor should be an oil of the highest grade obtainable and must be used only in the smallest practicable quantity. Oils meeting with the greatest success have generally possessed properties as follows: d. 15° 0.870 to 0.915, viscosity (Redwood) 400-1000 sec. at 70° F. and 75-125 sec. at 140° F., closed flash point not less than 400° F., color, red or yellow by transmitted light, but clear. Both straight mineral oils and compound oils have met with success on Diesel engine compressor service, but the majority of successful oils have been straight mineral oils.

R. L. SIBLEY

The recovery of lubricating oil. A. J. WILSON. *Petroleum World* 18, 29-30 (1921).—A résumé of the means commonly employed for treating lubricating oil which has already been passed through the engine and become too dirty to justify its further use without treatment.

R. L. SIBLEY

The effect of crystalline paraffin wax upon the viscosity of lubricating oil. E. W. DEAN AND L. E. JACKSON. U. S. Bur. of Mines, *Reports of Investigations* No. 2249, 3 pp.—Changes in the content of paraffin wax up to 9% in Penn. lubricating oil fractions have a negligible effect upon the viscosity through a considerable range of temp.

E. C. BINGHAM

Preservation of chemical works plant and structures (JONES) 26. Bearing of a synthetic dye industry upon our national welfare (BOGERT) 25.

HAWKES, WM. H.: **Factory Chemistry.** New York: Longmans, Green and Co. 59 pp. \$1.00 net. For review see *Am. J. Sci.* 2, 53(1921).

KISSLING, RICHARD AND HACKER, WILLY: **Fabrikation der Schmiermittel.** Meisen i. Sa.: Verlag Matthäus Bohlmann. For review see *Seifensieder-Zig.* 48, 357 (1921).

LUTHJE, H.: Die Trocknung wasserhaltiger Stoffe. Wittenberg: A. Ziemsen. M 3.75.

MARTIN, G., ET AL: Industrial and Manufacturing Chemistry. I. Organic. 5th Ed. revized and enlarged. London: Crosby Lockwood and Son. 800 pp. For review see *Expt. Sta. Record* **44**, 409(1921).

Drying. G. D. HARRIS. Brit. 161,598, Aug. 5, 1919. In evapg. moisture from paints, paint materials, fertilizers, peat, soap in bar or cake form, linoleums and other coated materials in web or sheet form, wood, fruit and vegetables, etc., the moist material is sepd. into individual masses, a heated drying-medium is directed into contact with the masses in succession, the medium is reheated between its successive contacts with the masses, and the heating and reheating of the medium are regulated so as to maintain it throughout its flow at a substantially const. temp. such that each of the masses of material after contact with the medium remains in a condition for the free transudation of moisture. A suitable app. is specified.

Transporting fullers' earth, etc. L. G. HILT. Brit. 161,419, March 8, 1920. Fullers' earth, ground argillaceous rocks or marls, or other finely divided material or coarsely powdered or granular materials liable to produce dust are mixed with a soln. of Na_2SiO_3 or other binding agent sol. in H_2O and dried to form lumps that are dustless in transport. The powder, etc., is reformed by dissolving out the binder.

Self-lubricating compositions. O. R. BOUVERY and F. P. CONORT. Brit. 160,780, March 18, 1921. A self-lubricating compn. for bearings, etc., consists of a mixt. of about 100 parts of new or preferably regenerated rubber devulcanized by the process described in 160,779 (C. A. **15**, 2564) 200 parts graphite, and 90 parts of S or a sulfide such as Sb sulfide, molded under pressure and vulcanized at a temp of 165-170°.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER AND ALBERT R. MERZ

Physical investigation of soil. B. A. KEEN. *Sci. Progress* **15**, 574-89(1921).—A discussion of the dimensions and arrangement of soil particles, the soil moisture, the soil temp., and the soil atm. Cf. C. A. **15**, 566. JOSEPH S. HEPBURN

Asepsis of soils and plants. P. WAGUET. Institut Agricole International, Beauvais. *Rev. prod. chim.* **24**, 335-8(1921).—Review of the various methods tried out and proposed for preventing the infection of crops by noxious germs. A. P.-C.

The fertilizer situation in Scandanavia (Sweden, Norway and Denmark). J. SEBELIN. *Nordisk Jordbrugsforskning* 1919, No. 3, 104-26. E. J. C.

Results of further nitrogen experiments. SCHNEIDEWIND. *Landw. Wochschr. Sachsen* **20**, 153-5, 161-3(1918); *Expt. Sta. Record* **42**, 624.—A comparison of "potash ammonium nitrate," NaNO_3 , "sodammonium chloride," NH_4Cl , urea, urea nitrate, $(\text{NH}_4)_2\text{SO}_4$ and CaCN_2 as fertilizers. NH_4Cl depressed the starch content of potatoes. E. J. C.

The apatite-magnetite deposits of Dhalbhum, India. E. F. O. MURRAY. *Mining Mag.* **24**, 211-4(1921).—Particulars are given of phosphate deposits in India which might form the basis of an extensive fertilizer industry. A. BUTTS

The effect of common salt on the growth, quality, and water requirements of the sugar beet. P. MARKWORT. *Z. Ver. deut. Zuckerind.* **71**, 167-239(1921).—Although the beneficial influence of Na salts on the growth of certain plants is well established, the mechanism of this effect has not been cleared up sufficiently, and the purpose of

this investigation was to contribute to the soln. of this problem. Field expts. were made at 3 places on 4 different types of soil. Six fertilizer combinations were used, NaCl alone, complete fertilizer with N in form of NH_4NO_3 , the same plus NaCl, plus Na_2SO_4 plus CaCl_2 , and complete fertilizer with N in form of NaNO_3 ; all plots were repeated 5 times, with one check plot each. The wts. of roots and leaves were detd. separately, and analyses made. The pot expts. were made in 4 parallel series, with the same fertilizer combinations as above, supplemented by two more, in one of which K, and in the other Cl was left out of the complete fertilizer. In another series of pot tests the water requirements of the beet were investigated; the water content was kept in one half of the pots at 45%, and in the other half at 70% of the total capacity. The results of all the tests are given in detail in a number of tables, and the conclusions are summarized as follows. NaCl, and Na salts in general, favorably affect the quantity and quality of beets on heavy as well as on lighter soils, provided that abundant Na is furnished with only moderate doses of K. The favorable effect seems to be produced by the Na, and not by the acid ion, because Na_2SO_4 and NaNO_3 gave good results, but not CaCl_2 ; however, there is as yet no positive proof for this. The results from the Na are due partly to its depressing effect on evapn. and partly to an exchange of ions whereby certain less soluble salts are made available. Na applied to the soil migrates almost completely to the leaves, and reduces their K requirement to such an extent that larger quantities of K become available for the root, increasing both wt. and sugar content of the latter. It appears that the softening of the bones of stock kept on beet sugar estates may be caused by lack of Na, and may be remedied by Na fertilization of the soil, which in turn will increase the Na content of the stock feed produced.

F. W. ZERBAN

The fungicidal effect of the different metals against *Plasmopara viticola* and their place in the periodic system of the elements. A. WÖBER. *Z. Pflanzenkrankh.* 30, 51-9(1920).—If the at. wts. of the metals are plotted against their sp. grs. a series of wave-like curves is formed. Cu, Ag and Hg lie on the descending branches of three of these waves, and in a straight line. In general the fungicidal value of the metals decreases rapidly going in either direction from this line.

T. G. PHILLIPS

Compounds of the alkaline earths with proteins as adhesives for sprays. E. SCHAFFNIT. *Z. Pflanzenkrankh.* 31, 19-22(1921).—A casein-lime mixt. is sol. but becomes insol. on drying. It aids greatly in retaining insecticides and fungicides on the foliage when used either in a spray or a dust. For 100 l. of spray 20 g. casein and 5 g. CaO are sufficient. A search is being made for cheaper proteins to take the place of casein.

T. G. PHILLIPS

Employment of chloropicrin (trichloronitromethane) in disinfection of cereals. A. PIUTTI AND A. MANGO. *Giorn. chim. ind. applicata* 2, 677-82(1920).—Chloropicrin is an efficacious parasiticide. The proper dose is 20 cc. per cu. m. of surrounding space, whether occupied or not by cereal. The action should proceed for not less than 8 days where large quantities of cereal are to be disinfected. Methods of treatment of grain and protection of workmen are given. Chloropicrin does not injure corn in any way, either com., technically, or chem., nor has it any influence on leavening of bread with natural yeast produced for the same grain. Germinability of the grain is diminished about $\frac{1}{4}$. Chloropicrin is not combustible, in this showing an advantage over CS_2 ; it does not alter the money value of the cereal, as does SO_2 , and is superior to HCN because of its lower toxicity. Also because of its great lacrimogenic power it can be detected at dilns. ($1:3 \times 10^4$) that do not exercise any action upon the organism and that permit the workers to be informed of its presence in sufficient time to provide themselves with mask protection. The authors give the principal results obtained by some French investigators on disinfection with chloropicrin.

ROBERT S. POSMONTIER*

WAGNER, PAUL. Anwendung kunstlicher Düngemittel. Berlin: Paul Parey. For review see *Chem. Weekblad* 18, 351(1921).

Fertilizer. E. H. SAMS. Brit. 161,777, Feb. 17, 1920. A fertilizer is made by mixing ground or pulverized house refuse, or ashes obtained by burning house refuse, with chalk and grinding or pulverizing the mixt.

Fertilizers. L'AZOTE FRANÇAIS, SOC. ANON. Brit. 160,810, Mar. 29, 1921. Nitrophosphate, obtained by treating $\text{Ca}_3(\text{PO}_4)_2$ with HNO_3 is neutralized by means of cyanamide and the pasty product obtained is dried by admixt. with a powdered solid. The powder is preferably such as will supply elements useful to the soil; cyanamide itself, natural phosphates, slag, KCl and K are mentioned as suitable.

Phosphate fertilizers. J. J. MOREL. Brit. 160,847, Aug. 14, 1920. Natural calcareous phosphates or analogous phosphates, such as bone phosphate, which contain $\text{Ca}_3(\text{PO}_4)_2$ and CaCO_3 , are treated in a rotary furnace with a current of SO_2 , air and steam, at a temp. not exceeding $1,000^\circ$, whereby a mixt. of $\text{Ca}(\text{H}_2\text{PO}_4)_2$, CaHPO_4 and CaSO_4 is produced, which is suitable for use as a fertilizer. The presence of a small amt. of a chloride, such as CaCl_2 , facilitates the reaction. Cf. 4,036, 1883, 13,890, 1911 (C. A. 7, 202) and 13,891, 1911 (C. A. 7, 203).

Cultivating bacteria; fertilizers. J. G. LIPMAN. Brit. 161,553, Nov. 8, 1920. A culture of S bacteria is obtained by maintaining a moist mixt. of S, phosphate rock, and fertile soil, with small quantities of the sulfates of Fe and Al, at a temp. of $70-90^\circ\text{F}$. for several weeks. The culture is dried and mixed with S, which is ground either before, during, or after the mixing. In this mixt. the bacteria are in a latent state but they become active when the mixt. is added to moist soil and their products have a fertilizing action and also destroy injurious fungi, insects, and weeds. Instead of being mixed with S alone the culture may be mixed with S and gypsum, with or without CaCO_3 , or with S and peat, or S and glauconitic marl or other potash-containing material. The culture of S bacteria may be grown in a liquid medium which is afterwards sprinkled on S, dried, and if desired mixed with additional dry S. Cf. C. A. 15, 570.

16—THE FERMENTATION INDUSTRIES

H. S. PAINE

Industrial alcohol. CHARLES BLANCHET. *Rev. ing. index tech.* 28, 179-85, 211-9 (1921).—Review of the various industrial processes of producing alc. with special references to its possibilities as a fuel, especially as a substitute for gasoline in explosion motors.

A. P.-C.

The wines from pressed yeasts and the methods used for their analysis. J. ŠEBOR AND J. DOXÁTH. *Chem. Listy* 15, 82-7(1921).—The analyses of a number of wines from pressed yeasts are given. Bertrand's method for the detn. of reducing sugars is satisfactory. The removal of amino compds. by clarification with $\text{Pb}(\text{OAc})_2$ did not affect the reducing power of the wines tested to any noticeable degree. A new Cu-reducing sugar (glucose and invert sugar) table is given, differing from those of Allihn and Kjeldahl. Votoček's method (titration of Cl^- with Hg^{++} in the presence of nitroprussiate of sodium as an indicator) gives the best results for the detn. of NaCl. A new method for the estn. of H_2SO_4 is proposed. This essentially consists of adding an excess of 0.1 N $\text{Ba}(\text{ClO}_3)_2$ to the soln. contg. the sulfates. The excess Ba is then detd. by back titration with 0.1 N K_2CrO_4 . The reaction is considered ended if a drop of the soln. titrated produces a red coloration when placed on a paper impregnated with an alc. soln. of AgNO_3 .

JOHN M. KANO

Analysis of "Chicha" (fermented beverage). C. D. ANDRADE. *Bol. lab. municipal Guayaquil* 1, 71-4(1920).—An analysis of a fermented liquor made from maize and locally used in Ecuador is reported as follows: 10 samples contained from 4.15 to 8.7 g. acidity as tartaric acid, 23.50 to 54.63 g. alc., 7.65 to 9.17 g. sugar, 5.98 to 6.40 g. nitrogenous materials, 4.05 to 4.70 g. glycerol, 2.59 to 2.93 g. ash per l. of the beverage. A theoretical discussion of the biochem. changes occurring in this material and the probable explanation of the physiol. effect of the drink is given. R. B. DEEMER

Preparation of citric acid by molds. DOMENICO GANASSINI. *Boll. chim. farm.* 59, 289-95, 313-7(1920).—A culture medium contg. 10% glucose, 5% citric acid and tap water was exposed to the air until a growth of mold was obtained. This culture, without identification of the organism, was inoculated in sterile Pollacci medium, then transferred to a bean decoction contg. CaCO_3 and 10% glucose, and kept at 25°. The yield of citric acid obtained in % glucose was—20 days 18%, 30 days 25%, 50 days 35%, 65 days 60%. The last no longer contained a trace of glucose. With 20% glucose in the medium, the max. yield of 70% citric acid was obtained.

Wood waste (Boas) 22. History of alcoholic fermentation in ancient China (Wang) 2.

Fermentation processes. A. RÖMER AND DEUTSCH-KOLONIALE GERB-U-FABRIK GMBH. *Brit.* 161,870. June 17, 1920. A continuous fermentation process for industrial sugar solns. consists in passing the liquid through a series of closed vessels containing filters impregnated with yeast or other ferment, the rate of flow being adjusted so that complete fermentation is effected. The order of the vessels is changed from time to time to prevent destruction of the ferment. The process is applicable to the production of butyl alc., glycerol, lactic acid, butyric acid, citric acid, acetone, etc., as well as ethyl alc.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

The simple detection and qualitative tests for morphia, its compounds, and derivatives. B. E. READ. *Peking Union Med. Col. China Med. J.* 35, 141-5(1921).—The opium traffic is illegal in China, but many remedies are being exploited which, while aimed to alleviate the craving for opium, contain its essential principle. R. develops a short method which it is hoped any hospital can use in detecting and stamping out the traffic. A simple extn. is made with chloroform, followed with a form of Kobert's test. A good abstract is given of all available methods. W. M. H. ADOLPH

Alkaline opium. BISCARO GIUSEPPE. *Boll. chim. farm.* 59, 361-3(1921).—Detn. of morphine according to the French Pharmacopeia, where the opium sample is treated with $\text{Ca}(\text{OH})_2$ and the aq. soln. pptd. with NH_4Cl , gives higher results than the methods of the Italian and the U. S. Pharmacopeias, which ext. first with H_2O on the assumption that the morphine is originally present as salts. The residue from this aq. ext. may yield an additional 3% after treatment with 10% NaCl acidified with lactic acid. This represents insol. free morphine in the sample. G. recommends that extn. of the original sample be made with 10% NaCl acidified with lactic acid. This gives a purer product as well as a more complete extn. Lactic acid is preferable to other acids because it is a normal constituent of opium. A. W. DOX

The alkaloids of valerian. A. GORIS AND CH. VISCHNIAC. *Compt. rend.* 172, 1059-1061(1921).—G. and V. have confirmed the work of Waliszewski (*Union pharm.* 34, 251(1893)) with reference to the existence of two alkaloids (chatinine and valerine)

in valerian root. By extn. of 5 kg. of the alk. aq. ext., obtained from 40 kg. of the fresh root, with a mixt. of CHCl_3 and Et_2O and subsequent sepn. of the two bases by shaking out the CHCl_3 - Et_2O mixt. with acidified H_2O and then shaking out with CHCl_3 and Et_2O separately, 4 g. of crude chatinine and 1 g. of valerin were obtained. The picrate and hydrochloride of chatinine are cryst., the other salts, including the chloroplatinate, are amorphous. The picrate m. 97-98°, the hydrochloride m. 115°. The latter, however, begins to decompose at 100°. In the dog 0.01 g. per kg. of body wt. of a mixt. of the two alkaloids (in the proportion in which they occur in the plant) produced sluggishness and torpor, but no incoördination of movements. In view of the feeble action of these alkaloids, it is concluded that the therapeutic action of the drug cannot be attributed to their presence.

A. G. DuMEZ

Matriculation sheets. A. SCHAMMELHOOT. *J. pharm. Belg.* 3, 300, 312, 353, 368(1921); cf. *C. A.* 15, 1962.—Tentative monographs proposed for introduction into the Belgian National Formulary are submitted for the following items: Colchicine, cinchonidine sulfate, chloralformamide, caffeine hydrobromide, and CuO .

A. G. DuMEZ

Popular remedies for dropsy and their interpretation. F. NETOLITZKY. *Pharm. Monatshefte* 2, 45-53(1921).—A critical study of the various medicaments and treatments applied in both ancient and modern times.

W. O. E.

The employment of drugs as medicines. CASPARIS. *Basel. Schweiz. Apoth. Ztg.* 59, 205-12, 217-22(1921).—A general statement of the methods by which our drugs entered into therapeutic use in the past, and a plea for an examn. by modern methods of the discarded drugs of the immediate past.

F. F. HEYROTH

The use of edestin in determining the proteolytic activity of pepsin. JOSEPH F. BREWSTER. U. S. Dept. Agr. Bur. Chem. *J. Biol. Chem.* 46, 119-27(1921).—The official "U. S. P. method" for the assay of pepsin in which egg white is used as the substrate is quite unreliable; the whites of eggs vary in compn., errors are readily, though unwittingly, introduced in the prepn. of the material and it is often very difficult for the analyst to obtain check results. Edestin, prepd. by crystn. from NaCl soln. is a very satisfactory substrate for pepsin assay provided the procedure for obtaining the material and for performing the pepsin test is carefully standardized. The edestin present in a given prepn. is measured by a careful N detn. *Prepn. of edestin.*—Prepare the edestin from fat-extd. ground hempseed by extg. the air-dried meal with 5% NaCl soln. (instead of 10-20%) and recryst. as described by Osborne. (Details of B's procedure can be obtained in mimeographed form from the Bur. of Chem.) After filtering the recrystd. edestin, wash it twice with each of the following; 50% alc., 95% alc., abs. alc., and finally 3 times with Et_2O , then air-dry at room temp. *Apparatus.*—An elec. heated and regulated const.-temp. water bath with stirring mechanism capable of regulation to within $\pm 0.05^\circ$; an oblong wire rack to hold the tubes; test-tubes of Pyrex glass, 15×115 mm. or bacterial culture tubes of the same size with heavy walls; four 1-cc. pipets graduated in 0.01 cc. and certified by the Bur. of Standards. *Reagents.* 1% edestin soln.—From the N detn. calc. the wt. of prepn. to furnish 1 g. of pure edestin. Weigh out this amt., transfer to a 100-cc. beaker and add a few drops of H_2O from a buret. Thoroughly mix to a paste before adding more H_2O as the ease of soln. depends on first thoroughly wetting the edestin. Add more H_2O in small portions until 25 cc. have been added. Stir the mixt. to disintegrate the paste and run in 0.2 N HCl in 0.5-cc. portions from a buret and stir until 25 cc. have been added. The edestin should be completely dissolved and the soln. clear without opalescence. Transfer the soln. to a 100-cc. volumetric flask, rinse the beaker thoroughly with 0.1 N HCl and pour the rinsings into the flask. Fill to the mark with 0.1 N HCl . This soln. of edestin in HCl should not be used if it has stood for over 48 hrs. 1% pepsin

soln.—Pulverize the sample of pepsin, pass it through a 60-mesh sieve and dry *in vacuo* over H_2SO_4 . Place the dried sample in a small tube and keep tightly corked. Weigh out quickly 1 g. of the pepsin, transfer to a 100-cc. beaker, add 5-cc. of 0.05 *N* HCl and stir to a paste with a glass rod. Add more 0.05 *N* HCl to dissolve the pepsin and transfer the solns. and washings to a 100-cc. volumetric flask, making up to the mark with the same acid. If the soln. is cloudy, pass it repeatedly through a dry filter paper. It is not always possible to remove all cloudiness but repeated filtration removes filter fibers which may be mistaken in the test for undigested protein. *10% NaCl soln.*—Dissolve 100 g. of NaCl in distd. H_2O , make up to 1 l., pass the soln. through a dry paper and repeat the filtration through the same paper to remove all suspended matter. *The assay.*—Place a series of 6 thoroughly clean, dry test-tubes in a convenient rack, numbering them from 1 to 6. Into these introduce the reagents successively from the 4 graduated pipets, 1st the 1% edestin soln., 2nd 0.1 *N* HCl, 3rd 10% NaCl, 4th pepsin. Add the edestin soln. in increments of 0.25 cc. to tubes 1–4, beginning with 0.25 cc. in tube 1. Place 1 cc. in each of tubes 5 and 6. The last 3 tubes are done in triplicate to serve as a check on each other, as in the higher concn. of edestin the protein is sometimes pptd. as a curd which becomes very compact and resistant to peptic action. Add 0.1 *N* HCl in decrements of 0.25 cc. beginning with 0.75 cc. in tube 1. Tubes 4, 5, and 6 receive none. Now add 1 cc. of 10% NaCl soln. to each tube to ppt. the edestin. Do not shake the tubes at this time. Set down the time of beginning the digestion in tabular form along with the records of the tubes. It is most convenient to space the time intervals 1 min. apart as this allows ample time for filling the pipet and delivering its contents. Add 1 cc. of the pepsin soln., beginning the addition on the instant the second hand of the watch reaches the 60-sec. graduation. This should correspond with the min. set and recorded for each sp. tube. As soon as all the pepsin is added, grasp the tube by the top and shake gently by describing 1–2 small horizontal circles with the bottom to mix the contents thoroughly. Take care not to force any edestin particles up on the side of the tube and do not shake too violently, as it tends to cause the formation of a stiff curd and it is desirable that the ppt. be retained in a flocculent condition. Place the tube immediately in the const. temp. bath, which is held at 37.5°. During the digestion shake the tubes as described above at 5-min. intervals. Take the time of the end of the reaction at the instant the pptd. protein is completely liquefied and the contents of the tube become perfectly clear. This point is usually very sharp, particularly in the lower concns. The error in the higher concns. is not greater than ± 15 secs. Watch tube 1 closely as it is the first to clear and its time interval may be used as a guide in approximating the intervals of the other tubes. It may be used also in detg. end-points of the others by comparison. If *s* represents the vol. of substrate and *t* the time of digestion, $t/s = \text{const.}$ and the relative values of pepsin samples are found directly. If more data are desired on which to base calcs. increase the number of tubes and change the vols. of edestin soln. Arrange in increments of 0.1 cc., beginning at 0.2 cc. and change the decrements of 0.1 *N* HCl accordingly. Carry out the rest of the procedure precisely as described.

A. P. LOTHROP

The determination of manganese in Norwegian Digitalis purpurea. KNUTSEN. *Wiss. Beih. Norw. Apoth.-Ztg.* 1921, No. 2; *Pharm. Zentralhalle* 62, 205(1921). —Digitalis grown in soil contg. 0.21% Mn had the following Mn content for leaves, blossoms, stems and roots: 0.052%, 0.047%, 0.016% and 0.032%, resp., while the ash content was, 7.02%, 7.69%, 3.93% and 4.42%, resp. The Mn was detd. by extg. the ash with HCl and concg. to remove silica. The residue was taken up with dil. HCl, the Fe and Ca were removed by the acetate method, and the Mn was oxidized to MnO_2 by Br water. The MnO_2 was then detd. by the $KI-Na_2CO_3$ method.

H. A. SHONLE

Cod-liver oil emulsions. I. CLEMENS GRIMME. *Inst. f. angew. Bot., Hamburg*

Pharm. Zentralhalle **62**, 156-9(1921).—The fat content was detd. by extg. 10 g. of the emulsion, previously boiled with 5 cc. concd. HCl, with Et_2O ; by using Gerber's butyrometer method on a 10-g. sample dild. with 40 g. 5% gum arabic soln.; or by extg. a 200-g. sample with Et_2O , acidifying the residue with 100 cc. HCl, and again extg. with Et_2O . A large acid no. in the 2nd ext. indicates the use of alkali as the emulsifying agent. The samples analyzed contained from 17.31 to 40.01% cod-liver oil. II. *Ibid* 187-192.—P was detd. by fusing 5 g. emulsion in a Pt dish with NaNO_3 and soda-lime. The ash was extd. with 50 cc. 5% HNO_3 and the P_2O_5 was pptd. from the ext. by molybdate soln. and detd. as $\text{Mg}_3\text{P}_2\text{O}_7$. Tables are given comparing market price with cod-liver oil content.

H. A. SHONLE

Determination of yohimbine. ARNOLD SCHOMER. *Pharm. Zentralhalle* **62**, 169-71(1921).—After powdering, 15 g. of the bark were extd. by shaking 10 min. with 150 g. Et_2O , adding 10 g. 15% NaOH soln., and shaking 30 min. 100 cc. of the ext. was removed and extd. with 1% HCl, and the latter was extd. with CHCl_3 , Na_2CO_3 was added and the alkaloid was extd. with CHCl_3 . The solvent was evapd., the residue dried at 100° and then dissolved in 30 drops abs. alc. to which 30 drops of concd. HCl were added. After cong., 50 g. CHCl_3 were added, and the yohimbine-HCl was sepd. by filtering, dried at 100° and weighed. The m. p. of the crude hydrochloride is 272° .

H. A. SHONLE

Present position of the camphor industry. ANON. *Bull. Imp. Inst.* **18**, 524-36(1920).—The article is of economic interest and discusses the past, present and future sources of camphor. The profitable manuf. of synthetic camphor will undoubtedly follow soon.

R. L. SIBLEY

The Japanese agar-agar industry. ANON. *Farben-Ztg.* **26**, 1849(1921).—A very brief review of manufg. processes and production statistics.

F. A. WERTZ

The constitution of the cinchona alkaloids and their synthesis (LÉGER) **10**. The roots of *Rheum emodi*, Webb (HOLMSTROM) **10**. Some mercury compounds of cyclohexane (TIFFENEAU, Gannagé) **10**. Glucosides. VIII. Glycyrrhizin (KARRER, ET AL.) **10**.

PARRY, ERNEST J.: **The Chemistry of Essential Oils and Artificial Perfumes.** London: Scott, Greenwood and Son. 552 pp. 30 s. For review see *Pharm. J.* **106**, 390(1921).

TSCHIRCH, A.: **Handbuch der Pharmakognosie.** Band III. Leipzig: Chr. Herm. Tauchnitz. M 10. For review see *Z. angew. Chem.* **34**, 236(1921).

Medicines. C. FARMACHIDIS. *Brit.* 159,957, Dec. 4, 1919. A medicine for use in cases of diabetes mellitus is made by removing adherent flesh from ox tonsils and then cutting them up and macerating for 24 hrs. in a soln. of Na_2CO_3 contg. alc. The mixt. of tonsils and soln. is then placed in a linen bag and compressed. The expressed liquid is dild. with a satd. soln. of Na_2CO_3 and filtered. A suitable flavoring tincture is added to the filtrate, which is then ready for use. The residues in the bag and on the filter may be worked up a second time.

Anesthetics. FARBERWERKE VORM. MEISTER, LUCIUS, and BRÜNING. *Brit.* 161,539, Apr. 9, 1921. α -Dialkylaminoethyl- β -aracyloxybutyric esters are obtained by esterifying, with an aromatic acid or its equiv., the corresponding hydroxy compds. of the general formula $\text{R}'\text{NCH}_2\text{CH}_2\text{CH}(\text{CHMeOH})\text{CO}_2\text{R}'$, in which $\text{R}' = \text{alkyl}$ and $\text{R}' = \text{two alkyls or one alkylene}$ (for instance pentamethylene). According to an example, $\text{Et}_2\text{NCH}_2\text{CH}_2\text{CH}(\text{CHMeOH})\text{CO}_2\text{Et}$ is treated with BzCl in C_6H_6 soln., the product

extd. with H_2O , and the Bz deriv. obtained from the aq. soln. as an oil by treatment with alkali followed by ether extn. The products are local anesthetics. α -Dialkylaminoethyl- β -hydroxybutyric esters are obtained by treating sodioacetoacetic ester with a dialkylaminoethyl halide and reducing the resulting ketone.

Vaccines. D. THOMSON. Brit. 161,341, Jan. 23, 1920. Non-toxic vaccines are prepd. from germs by sepg. the alkali-, acid-, and alcohol-sol. portions by successive pptns. Tubercle bacilli, gonococci, or Pfeiffer bacilli are treated with an alk. soln. and the solid residue is removed. The soln. is treated with acid, and the resulting ppt. is neutralized and then treated with alc. to form a ppt. *A*. The acid soln. is treated with alc. to yield a ppt. *B*. The residue of the germ substance not sol. in alkali is treated with acid and the soln. obtained is rendered alk. to give a ppt. *C*, and then treated with alc. to give a ppt. *D*. The residue of germ substance not dissolved by the alkali nor by the acid is treated with alc. to give a soln. from which a ppt. *E* is obtained by the addition of salt soln., and the final residue of germ substance is treated with chloroform to obtain an ext. which is evapd. to dryness and washed with alc. to yield a residue *F*. The substances *A*, *C*, *E*, and *F*, with or without *B* and *D*, are emulsified with normal saline soln. and standardized for use as vaccines. Cf. 136,036 (C. A. 14, 1185).

Organo-mercuric compounds. J. D. RIEDEL AKT.-GES. Brit. 161,922, April 15, 1921. Water-sol. derivs. of salicylic acid containing nuclear mercury are obtained by treating hydroxy-mercuric-salicylic acid anhydride or the like with a sol. cyanide at moderate temps. and sepg. by fractional crystn. the resulting *o*- and *p*-compds. of the formula $NC.Hg.C_6H_4(OH)COOR$, where R may be K. The reaction may be effected with cooling and in the presence of such quantity of H_2O that both salts are sepd.; the liquid is iced before filtering. The product may be washed on the filter successively with ice H_2O , 50% alc., and concd. alc., and lixiviated with 3 times its wt. of H_2O at 25°. to ext. the more sol. *p*-compd.; the residual *o*-compd. is then recrystd. from hot H_2O . Alternatively, the reaction may be effected in the presence of more H_2O at ordinary temps.; after heating, the *p*-compd. is found in the soln. and the *o*-compd. remains undissolved. By adding acids to the aq. solns. of the K salts the free acids may be pptd. The Ag salts may be prepd. by adding Ag nitrate. The K salts are suitable for therapeutic use.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

F. C. ZEISBERG

A recent procedure for the manufacture of sulfuric and hydrochloric acids. G. BATTY. *J. pharm. Belg.* 3, 345-6(1921).—A short historical review of the method of mfg. H_2SO_4 in which the SO_2 is oxidized by means of Cl_2 with the simultaneous formation of HCl.

A. G. DUMÉZ

Synthesis of alkali cyanide from atmospheric nitrogen. RYOSABURO HARA. *Tech. Reports Tohoku Imp. Univ. Sendai, Japan* 2, 1-40(1921).—See C. A. 14, 2840.

F. P. PHELPS

Vegetable and mineral sources of alkali salts in Nigeria. ANON. *Bull. Imp. Inst.* 18, 484-90(1920).—The ash from 6 different vegetable sources contained from 28.76 to 81.16% KCl but the production is very limited. Other samples of salts obtained by lixiviation of salt-impregnated earth contained from 0.42 to 10% KCl, although one contained 51.12%. This last (Sheri salt) was prepd. by scraping up the saline incrustation left after the pools at the saltings had dried up, extg. the material with H_2O and evapg. the liquid to dryness over a grass fire.

R. L. SIDLEY

Wood waste (Boas) 22.

Ammonia. L'AIR LIQUIDE, SOC. ANON. POUR L'ETUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 160,811, Mar. 29, 1921. In app. for the synthesis of NH_3 under high pressure, the reacting gases are brought to the reaction temp. by circulation around the tube contg. the catalyst, which tube is formed of or covered with heat-insulating material. A suitable app. is specified.

Ammonia; urea. S. GIERTSEN. Brit. 160,857, Aug. 14, 1919. Cyanamides such as com. CaNCN or a soln. of it from which the bases have been pptd. is heated with SO_2 with or without H_2O , under pressure. If urea is the product desired, temps. of $80-90^\circ$ are used; NH_3 is formed at temps. above 90° . An excess of SO_2 may be used so as to dissolve all the Ca as $\text{Ca}(\text{HSO}_3)_2$, from which CaSO_3 may be obtained, for instance by treatment with CaO ; and graphite remains insol. and is sepd. There, action may be facilitated by the use of a catalyst.

Distilling ammonia. R. P. DOUGLAS. Brit. 161,244, Dec. 31, 1919. In NH_3 stills in which the liquor passes down a primary still for sepn. of H_2S and CO_2 , then into a liming chamber, and through a final still, a portion of the vapor is withdrawn from the liming chamber and passed through a reflux condenser to sep. H_2O , and into an ordinary condenser to obtain a concd. soln. of NH_3 . This may be used to neutralize free acid in $(\text{NH}_4)_2\text{SO}_4$.

Ammonium chloride. O. L. CHRISTENSON and B. A. HEDMAN. Brit. 161,161, Feb. 25, 1921. Addition to 159,817 (C. A. 15, 2159). The process described in the parent case for the recovery of NH_3 as NH_4Cl in the distn. of coal, consisting in the addition of an alkali or alk.-earth chloride together with SiO_2 to the furnace charge, is applied to the distn. of alum slate or other bituminous slate or shale. In an example, the furnace charge consists of an intimate mixt. of rock salt, quartz, H_2O , and shale. The products of the distn. are either condensed together as a liquor, or are only cooled sufficiently to deposit the NH_4Cl in the solid state.

Magnesium chloride. V. M. GOLDSCHMIDT. Brit. 161,165, Mar. 9, 1921. O compds of Mg are converted, in the presence of S or its non-oxygenated derivs., e. g., S_2Cl_2 , into anhydrous MgCl_2 by the action of a gas containing Cl. Preferably MgO is used as the starting material, but the carbonate and sulfate and the double carbonate or silicate of Ca and Mg may also be employed. The reacting materials must be dry and substances capable of forming H_2O must be absent. Until the last stage is reached, the process is carried out below 700° , so that the product does not fuse and thereby impede the reaction. A little C is added when the chlorination is conducted at about 300° to convert the small quantity of MgSO_4 which is also produced, into MgO . The latter is readily sepd. from the fusible chloride. Any app. for treating solids with gases may be used, e. g., raw materials may be fed into the top of a cylindrical vessel and Cl passed in at the bottom while the S_2Cl_2 and other condensable products are cooled and returned to the reaction zone. Advantageously the process may be worked in conjunction with the electrolysis of the MgCl_2 ; the hot Cl from the latter is used directly for the chlorination.

Aluminium chloride. ARMOUR FERTILIZER WORKS. Brit. 160,759, Feb. 11, 1921. AlCl_3 is produced by the action of Cl on AlN. A tube-furnace is packed with briquets of the nitride, which may contain small % of Al_2O_3 and C, and is heated internally, e. g., by means of burning gases. When the necessary temp. has been reached the fuel gas is cut off and Cl is introduced. AlCl_3 sublimes and is collected. The process is rendered continuous by introducing regulated quantities of AlN at the top of the furnace and removing the residue from the bottom. The Cl may be generated *in situ*.

Aluminium sulfate. P. SPENCE and SONS, LTD., H. SPENCE, and W. B. LEW-

ELLYN. Brit. 161,606, Oct. 11, 1919. The invention is a modification of the process described in 9,148, 1913 (C. A. 9, 2700) in which impure basic $\text{Al}_2(\text{SO}_4)_3$ solns., obtained by treating ground aluminous material with H_2SO_4 , are freed from Fe by agitation with K_2SO_4 in the presence of the suspended undissolved materials. The modification consists in adding specially prepd. finely divided insol. matter called "nucleus material" to the substantially clear $\text{Al}_2(\text{SO}_4)_3$ soln. containing a K salt, before agitating. The insol. siliceous residue from the treatment of the finely ground aluminous material with H_2SO_4 , when re-ground in the wet condition is suitable as nucleus material but finely divided native alunite or other insol. substance may also be used. It is added in the form of mud either at once or in portions as the purification proceeds. A portion of the sepd. solids may be used as nucleus material, after further regrounding, in the next operation and valuable constituents are recovered from the remainder, e. g., by treating with H_2SO_4 , preferably after the content of pptd. matter has been raised by repeated use. Cf. 3835, 1882 and 1189, 1889.

Copper sulfate. P. A. MACKAY. Brit. 161,656, Jan. 9, 1920. Pure Cu is dissolved in H_2SO_4 or oleum in the presence of a sol. compd. of a metal electronegative to Cu such as Ag or Hg, or Se. The electronegative element may be added to the acid and then a solvent for it, such as HNO_3 for Ag or Hg. When blister Cu is employed as raw material, one of its impurities may be used as catalyst, with the addition of the necessary solvent, say HNO_3 for Ag or H_2SO_4 for Se. If an excess of Cu is employed, the electronegative metal used and any gold or silver in the Cu are deposited on the excess Cu and may be recovered. The process may be employed for refining Cu.

Barium and strontium sulfates. P. A. MACKAY. Brit. 161,655, Jan. 9, 1920. Ba and Sr sulfates are obtained in white finely divided form by grinding the native sulfates, dissolving in H_2SO_4 containing free SO_2 in soln., and pouring the soln. into H_2O to ppt. the dissolved sulfates.

Acid sodium pyrophosphate. A. KELLY. Brit. 161,273, Jan. 5, 1920. $\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$ is obtained by adding the calcd. amt. of an acid such as H_2SO_4 to a soln. of $\text{Na}_2\text{P}_2\text{O}_7$ and then salting out the product, for instance, by adding NaCl. The ppt. may be washed with a satd. soln. of the same salt.

Alumina, etc. H. G. WILDMAN. Brit. 161,310, Jan. 14, 1920. Clay is boiled with an alk. soln. preferably prepd. by treating a soln. of soda ash with a quantity of CaO insufficient to convert all the carbonate to hydroxide, and the clear liquor, after settling, is drawn off. The treated clay is mixed with H_2O , and SO_2 is forced into the resulting suspension until no more is absorbed. The pptd. SiO_2 is filtered off, and the soln. run into a vacuum pan fitted with closed steam coils. On heating, the Al sulfite is pptd., and the SO_2 that is evolved at the same time is stored for further use. The Al sulfite is removed, washed and ignited to Al_2O_3 . The SO_2 evolved is recovered. If a trace of S remains after the ignition it may be washed out with dil. NaOH. The Na_2SO_3 soln. remaining after the Al sulfite is filtered off, if treated with CaO, yields NaOH soln. ready for treating fresh clay, and the pptd. CaSO_3 on ignition regenerates SO_2 . When Fe is present, the clay is heated before it is treated with alkali so that it does not go into soln. with the Al. Cf. C. A. 14, 603.

Zinc oxide. NEW JERSEY ZINC CO. Brit. 161,156, Jan. 14, 1921. In the production of ZnO by volatilizing Zn in a retort and burning the vapor a substantial body of molten Zn is maintained in the retort by adding Zn thereto from time to time to replace that which has been volatilized; the Zn so added is preferably molten and at a temp. near the b. p. The Zn may be drawn directly from a spelter furnace, but it is preferred to feed the retorts from a sep. melting furnace in which a large quantity of Zn is maintained molten so that any inequalities in compn. of the Zn supplied to this furnace are equalized before it reaches the retorts. A suitable construction is specified.

Sulfur dioxide. RHEINLAND VEREIN CHEMISCHER FABRIKEN AKT.-GES. (formerly VEREIN CHEMISCHER FABRIKEN MANNHEIM). Brit. 161,581, Apr. 9, 1921. Addition to 19,705, 1920. SO_2 is obtained by heating a mixt. of an alk. earth (including Mg) sulfate, a sulfide of a heavy metal, and Fe_2O_3 . In an example, gypsum, pyrites, and Fe_2O_3 are heated to 900–950°, the proportions being in the ratio of 4.4:1:2–25, resp. In another example, the proportions are in the ratio of 5:1:3, resp. It is stated that about 8% of the S is obtained in the free state.

Sulfur burners. T. A. CLAYTON. Brit. 161,439, Apr. 9, 1920. Addition to 141,661. The S-burning app. described in the principal patent is modified by fitting a deflector at the inlet for the air for primary combustion, or by providing perforated pipes for the delivery of both primary and secondary air supplies. A suitable app. is specified.

Dental cements. S. SCHIFF. Brit. 161,868, June 16, 1920. Addition to 145,062 (C. A. 14, 3134). Colloidal silicic acid, either in the sol condition or as hydrogel, acetogel, or alcogel, is added to certain classes of dental cements to increase their hardness and transparency. The cements in question are those composed of ZnO and a soln. of ZnCl_2 or ZnSO_4 or a phosphate, and those containing silicates or polysilicates with oxides, phosphates, borates, etc. of various metals and a soln. of phosphoric acid. The colloidal silicic acid may be added either to the soln. or to the solid ingredient of the cement, or to both, or it may be used alone with metallic oxides.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

The composition of opaque glasses. J. B. KRAK. *Glass Industry* 2, 81–4(1920).—An account of the development of glasses for illuminating purposes. Such glass is like snow, colorless in itself but appearing white owing to the reflection and diffusion of light from innumerable small colorless particles. A number of methods for introducing these small particles into the glass have been and are in use. Alabaster and phosphate glasses are the oldest types and more recently the opacity has been produced with the aid of fluorides. A list of opacifiers includes Mg silicates such as talcum and asbestos, phosphates such as bone ash, calcined guano and Na phosphate, fluorides such as Na and Ca fluorides, lepidolite, cryolite and fluosilicates. With fluorides are used feldspar, china clay, Al_2O_3 or $\text{Al}(\text{OH})_3$. Occasionally oxides of Sn, Ti or Zr are used. Auxiliaries are As and Sb, NaCl and $\text{Na}_2\text{B}_4\text{O}_7$, alkali and alkaline earth sulfates. Definite knowledge of the exact cause of the opacity is lacking. Various investigators have ascribed it to devitrification, imprisoned bubbles of gas or to a solid emulsion, and to colloidal particles in suspension as in a pigment. Several old batches and recent patents are included in the article.

J. B. PATCH

Milk or alabaster glass. ASHER BLUM. *Glass Industry* 2, 84–5(1921).—A summary of 17 foreign and domestic patents for illuminating glassware. J. B. PATCH

Development of the glass industry. ALEXANDER SILVERMAN. *Glass Industry* 2, 92(1921).—Review.

J. B. PATCH

Notes on glass cutting. ANON. *Diamant* 42, 658(1920); *Glass Industry* 2, 90(1921).

J. B. PATCH

The manufacture of iridescent glass. OTTO WILHELM. *Diamant* 42, 601–2, 619–20(1920); *Glass Industry* 2, 85–6(1921).—Glass may be made iridescent by either the wet or dry method. The former procedure subjects the glass to the action of 20% HCl at 120° under a pressure of 5 atms. In the dry method the glass is heated in a

muffle and exposed to vapors of Sn chloride mixed with carbonates and nitrates of Sr, Ba and Cu according to the effect desired. Soft Pb and Na glasses give the best results.

J. B. PATCH

The modern gas producer. JULIUS BERMAN. *Glass Industry* 2, 86-7(1921).—For glass and ceramic factories B. recommends mechanical producers as a rule to replace direct firing of coal, oil or natural gas. The coal is best crushed and of a high content of volatile matter. Purchase the coal by analysis and weigh into the producers if possible. Keep the pressure of gas in the main const. and record it automatically. Analyze the gas and take tests of the fire beds with a poker. Watch the stack losses. Feed the coal uniformly and remove ashes frequently. The top temp. of the producers is very important. Cold gas tends to tar and hot gas ppts. soot, 1000-1350° F. being permissible limits. The gas pressure varies with conditions from 0.1 to 3 in. The best results are obtained by mechanically and automatically controlling the steam flow.

J. B. PATCH

A substitute for diamonds. ANON. *Diamant* 43, 180(1921); *Glass Industry* 2, 109 (1921).—"Volomit" or tungsten carbide has a hardness of 9.8, while the diamond is 10 on Mohr's scale. The compd. is prepd. at a temp. of 3000°.

J. B. PATCH

Pyrometry in the glass industry. R. P. BROWN. *Glass Industry* 2, 114-5(1921).—Pyrometers are in very general use in the glass industry. The next step is the automatic control by the pyrometers of valves governing the supply of fuel and air. Instruments and app. for this purpose are already on the market.

J. B. PATCH

Central bureau for improving fuel conditions established by the Association of German Glass Manufacturers. WM. M. CLARK. *Glass Industry* 2, 116(1921).—This coöperative bureau has been established to secure the most economical and efficient use of fuel. A consulting office is maintained and engineers and chemists visit the individual plants in an advisory capacity. Among the most important problems undertaken relating to fuel are the investigation and valuation of fuels on the market and specifications for their most suitable use, surveys of fuels of low heat value, selection of the best method of firing, gasification of coals and the best adapted generators, recovery of by-products, elimination of losses due to leaks and radiation, and utilization of the waste heat in the flue gases. Recording instruments of various kinds are advised and a school for their use is maintained at the headquarters of the bureau as well as standards for checking and calibration.

J. B. PATCH

Standardization of specifications for building materials; ceramic products. ANON. *Rev. mat. constr. trav. pub.* No. 136, 7B(1921).—The French standards committee has adopted the specifications of the technical committee of the Minister of War. Machine-made tile; texture, homogeneous, free from obvious cracks and laminations; ring, clear; color, uniform; surface, sufficiently flat to engage an adjoining tile for $\frac{2}{3}$ of the distance; frost-resistant; free from particles of uncombined lime; cross-breaking strength 100 kg. per sq. cm. The last two tests are to be made according to the methods of the testing lab. of the Conservatoire des Arts et Métiers.

E. W. WASHBURN

Porous brick and ceramic products. ANON. *Rev. mat. constr. trav. pub.* No. 136, 11B(1921).—Organic materials such as cut grass, oats, or other cereals, tan bark, coke dust, wood shavings, saw-dust and peat may be substituted for coal to be mixed with clays for making porous products. Such brick are less costly than those made from kieselguhr.

LOUIS NAVIAS

Kaolins, clays, bauxites, etc; changes in volume under the action of heat. A. BIGOT. *Compt. rend.* 172, 854-7(1921).—Test specimens were prepd. by grinding to 200-mesh, moistening with H₂O, and pressing into briquets in steel molds. The specimens were heated to successively higher temps. 100° apart, their lengths being measured after cooling from each temp. The results are expressed by temp.-length

curves, and from them it is concluded that bauxites, kaolins, etc. begin to shrink below 1000° , and only when they contain free SiO_2 do they show expansion below this temp. Clays and kaolins expand before reaching their fusion temps. but bauxites do not. Mixts. of kaolin and SiO_2 show very marked swelling before fusion. This property is utilized in prepg. artificial pumice stone by rapidly heating schist and porcelain to their swelling temps.

J. S. LAIRD

Lime-silica brick. C. BING. *Rev. mat. constr. trav. pub.* No. 136, 5B(1921).—A general review of manufacturing.

LOUIS NAVIAS

The waterproofing of kiln crowns. ANON. *Rev. mat. constr. trav. pub.* No. 136, 12B(1921).—A patented tile is described.

LOUIS NAVIAS

Burning stoneware. ANON. *Rev. mat. constr. trav. pub.* No. 140, 67-9B(1921).—Stoneware bodies contg. considerable CaO , should not be heated above cone 4a, for the CaO tends to form silicates, which are both fluid and corrosive and penetrate the pores and attack the less fusible materials. MgO under similar conditions gives very viscous silicates, whose chem. reactions are retarded by their poor mobility. The opposite is true of MgO at higher temps. Feldspathic stoneware, without CaO , may be heated to the fusion point of the feldspar (cone 9 or 10). Clays should be plastic, and attain their max. shrinkage at relatively low temps., i. e., between cones 07a and 4a. Their large Fe content colors them brown unless sufficient CaO is present to whiten them. If sulfates are present in the body, a basic or neutral glaze, fusing between cones 01a and 05a should be used. In the absence of sulfates an acid glaze is preferable. Fuel free from S should be used; otherwise sulfates will be formed, and attack the acid glaze. Firing should be carefully manipulated, to allow for the burning out of the carbonaceous matter and for the proper oxidizing of the glaze.

LOUIS NAVIAS

Prevention of scaling of burned clay pipes. ANON. *Rev. mat. constr. trav. pub.* No. 140, 76B(1921).—Scaling is due to laminations, poor mixing and grinding of the batch, faulty press machines, and unequal heating in the kilns. Scaling occurs during the dehydration period ($300-420^{\circ}$), but is evident only after salting and during the cooling period.

LOUIS NAVIAS

Correlation of late glacial annual clay-bands in North America with the Swedish time scale. G. DE GEER. *Geol. För. Forh.* 43, 70-3(1921).—G. has found that from 74% to 89% of the clay-bands seen in the U. S. agree with those in Sweden, extending from 720 to 1,200 years before the end of the ice age.

W. SEGERBLOM

Transformation of quartz into tridymite. ORAZIO REBUFFAT. *Giorn. chim. ind. ed. applicata* 2, 437-8(1920).—Fire bricks made largely of quartzite often disintegrate by expansion due to the transformation of the quartz into allotropic modifications of lower d unless burning has accomplished these transformations. The problem presented to R. was to distinguish quartzites which were best adapted to give fire bricks of a const. vol. in use. R. examd. quartzite from Lagonegro, which does give fire bricks of const. vol. This quartzite left a residue of sulfates amounting to 5.50%. It had a $d_{13} = 2.65$, and a d of 2.25 after being ignited by itself at $1300-1350^{\circ}$ for 8 hrs. It contained 0.31% P_2O_5 , considerable amounts of Fe_2O_3 and small quantities of other substances. The mineral washed with concd. HNO_3 (to remove P_2O_5) showed a $d_{13} = 2.60$, and the residue after ignition at $1300-1350^{\circ}$ at 8 hrs. had the same d. A very few original quartzites that left a residue in sulfates of only 0.69%, with a $d_{13} = 2.60$, showed the same d after similar ignition. When to this quartzite was added 3% of its wt. of an alk. glass of $d = 2.61$ and containing 16% P_2O_5 , and the mixt. ignited as before, the d became 2.22-2.27. The ignited residue showed under polarized light only a very few birefringent granules, behaving in this respect exactly like the calcined product of the Lagonegro quartzite. Hence the presence of small amounts of P_2O_5 induces the change of SiO_2 from the quartzose condition to that of the low-d quartz. Therefore,

quartzites which give fire bricks of const. vol. in use owe this characteristic property to the presence in the original quartzites of small amounts of P_2O_5 .

ROBERT S. POSMONTIER

Furnace atmospheres and some of their effects on lead glazes. F. BIGOT. *Rev. mat. constr. trav. pub.* No. 137, 20-21B(1921).— Pb_3O_4 at high temps. gives up some O, which combines with SO_2 . The SO_3 in turn combines with the PbO yielding $PbSO_4$. Weathering clays oxidizes the S oxides to the sulfate.

LOUIS NAVIAS

Certain types of testing furnaces used in the ceramic industries. C. MIRA. *Rev. mat. constr. trav. pub.* No. 136, 1-5B; No. 137, 17-20B(1921).

LOUIS NAVIAS

How to insulate a ceramic furnace. ANON. *Rev. mat. constr. trav. pub.* No. 136, 10B(1921).—Describes Sil-O-Cel.

LOUIS NAVIAS

A refractory manufactured from mica. ANON. *Rev. mat. constr. trav. pub.* No. 136, 15B(1921).—Waste mica is mixed with clay or with clay and crushed quartz and fired to a temp. sufficiently high to fuse the mica. The product is a good refractory and a good electrical insulator.

E. W. WASHBURN

The mineralography of the feldspars (ALLING) 8.

Adressbuch der Glasindustrie in Deutschland Coburg. Verlag von Müller and Schmidt. M 43.

Firing ceramic ware. ALLEGEMEINE ELEKTRIZITÄTS-GES. *Brit.* 150,814, Mch. 29, 1921. In the firing of ceramic ware in tunnel ovens the heating of the high-temp. zone is interrupted at intervals to allow the goods therein to cool down to a temp. at which they are sufficiently hard to allow the trucks to be moved forward without risk of damage. The gas connections to two adjacent tunnels may be so arranged that their high-temp. zones are fired alternately. During the interruption in firing the temp. of the preliminary heating zone of the oven is maintained or increased by auxiliary burners. Cooling devices may be fitted in the cooling zone and the heat abstracted may be used for drying.

20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

Cement colors and their chemical testing. C. R. PLATZMANN. *Farben-Ztg.* 26, 1894-5(1921).—Good cement and mortar colors should be mineral pigments, contain no free acids (SO_3, Cl) and H_2O -sol. substances, and be unaffected in color by CaO , cement, light, etc. The color strength may be detd. by the usual method of rubbing up the pigment with a definite amt. of ZnO . The relative coloring strength of an Fe_2O_3 pigment is dependent on its content of Fe_2O_3 , Al_2O_3 , and its loss on ignition. Black cement colors are either C or Mn blacks; ultramarine is best adapted for producing the blue colors; greens usually consist of Mg Al silicates and produce only dull green colors.

F. A. WERTZ

Embedding iron in cements containing blast furnace slag. RICHARD GRUN. *Stahl. u. Eisen* 41, 577(1921).—A general review in which the following conclusions are drawn. (1) Lab. expts. have shown that dangerous rusting of iron is prevented by alk. concretes. (2) Practice shows that in properly prepared reinforced concrete made from blast-furnace cement as well as from portland cement the embedded iron remains unchanged. (3) The results of lab. work show that in normal mixts. Mn iron-portland cements and blast-furnace cements as well as portland cement may be used for reinforced concrete.

R. S. DEAN

Acid-proof cement. KLEINLOGEL. Darmstadt. *Chem.-Zig.* 45, 432-3(1921).—Briquets made from 7 grades of acid-proof cement made by the Rössler Co., Bensheim a. d. B., were tested in hot and cold HCl, H₂SO₄, and HNO₃, and afterwards with H₂O, and were found to meet the requirements. J. H. MOORE

Report of committee on sampling creosote oil in tank cars. S. R. CHURCH, C. M. TAYLOR AND C. E. GOSLINE. *Proc. Am. Wood-Preservers' Assoc.* 1920, 31-43.—Details of the committee's recommendation for a standard method for sampling creosote in cars where more than the specified max. limit of water is known or suspected to be present. LOUIS E. WISE

Determination of water in creosote storage tanks. W. E. JACKSON. *Proc. Am. Wood-Preservers' Assoc.* 1920, 91-2.—In creosote storage tanks the top zone is water, the middle zone is an emulsion (consisting of 25% creosote) and the bottom is water-free oil. J's method for water detn. depends on the soly. of white lead paint in creosote. A length of 1/2" painted pipe is introduced into the tank and left in contact with the oil for 24 hrs. The paint is cleanly removed by the creosote in the bottom zone, softened by the middle layer of emulsion and unaffected by the water layer. The amount of water in the tank may then be approx. calcd. LOUIS E. WISE

Report of laboratory experiments to determine loss of creosote by evaporation from open-tank treatments. ERNEST BATEMAN AND G. G. TOWN. *Proc. Am. Wood-Preservers' Assoc.* 1920, 83-91.—The factors considered in collecting exptl. data were: temp. of creosote, vapor pressure of creosote at temp. used, rate of change of vapor pressure with loss, area of exposed surface, and amt. of air that must be satd. with creosote vapors. Three different creosotes were kept in lab. exptl. open tanks at 195° F. for several days. At intervals the tanks were filled to the mark with fresh creosote, and the loss was calcd. from the weight of creosote added. The following conclusions are reached: losses by wt. of creosote from open-tank treatments are proportional to the area of exposed surfaces and volatility of the oil. The % losses depend upon the area of the exposed surface, volatility of the creosote, and the amt. of oil in the tank. The amt. of loss per day per sq. ft. of surface at 195° F. (in lab. expts.) is given by the equation: $\log L = 0.0165 V - 0.347$, where L is loss in wt. per sq. ft. of exposed area and V the % of creosote distg. below 270° C. The % losses per day (at 195° F.) are given by the equation: $PL = L + (D \times \text{sp. gr.} \times 62.5)$, where PL = % loss; D = depth of tanks; sp. gr. = specific gravity of creosote at 195° F. Further expts. will be required to det. consts. at other temps. and for tanks of com. size. LOUIS E. WISE

Report on creosoted piling removed from Long Wharf, Oakland, California. F. D. MATTOX AND E. M. BLAKE. *Proc. Am. Wood-Preservers' Assoc.* 1920, 148-78.—Thorough investigation indicates that Douglas fir piling, driven in waters infested by marine borers under conditions such as those existing in San Francisco bay, has a life of 25 to 30 years (or more) provided sound timber and coal-tar creosote of a high grade are used. Care in handling and driving piles is essential. The report includes a series of analyses of creosote oil extd. from piles removed from the wharf after 18, 20, 22, and 29 yrs. of service. LOUIS E. WISE

Floor paper made from sponges. PAUL TACUSSEL. *Papier* 24, 198-9(1921).—Analyses of a large number of samples of felts for laying on floors under carpets and linoleums have given as the av. compn.: sponges 55%, animal fibers 20%, jute 20%, miscellaneous (spruce pulp, cotton, flax) 5%. It is sized with 5-8% of rosin, and is loaded with china clay. It contains about 10% H₂O and 13% ash. The paper is flexible, elastic, and rough to the touch. It is 3.5-4.5 mm. thick, has a bursting strength (Ashcroft) averaging 4.8 kg., and (for paper weighing 950 g. per sq. m.) a breaking length of 2,300 m. and an elongation of 4%. A. P. C.

The perforating process and its mechanical application. EDMUND M. BLAKE. *Proc. Am. Wood-Preservers' Assoc.* 1920, 55-73.—A comprehensive historical review of methods used in timber preservation with special reference to expts. carried out on perforation of timber (ties) prior to treatment. The mechanical applications of the perforation process are clearly outlined, and a brief description of the new Greenlee perforating machine and plate of the Greenlee drum are included. B. believes that perforation prior to treatment will control, reduce, or eliminate checking in green ties, and timber, provided perforating is carried out promptly after cutting. Perforation should cause reduction of temps. required to secure proper impregnation, reduce time of treatment, and insure complete and uniform penetration of the preservative to the depth of the perforation. Perforation should not reduce strength of the timber in compression perpendicular to the grain by more than 8-10%. LOUIS E. WISE

Wood impregnation. WILLY KINBERG. *Z. angew. Chem.* 34, Aufsatzteil, 183-4 (1921).—K. recommends the following combinations (under pressure) in preservation of pine wood:—(a) NaF and creosote mixed, (b) $ZnCl_2$ and creosote, (c) creosote alone according to the Rüping process. Impregnation should be carried into the heart-wood. The "mixed kyanizing process" (Gemischkyanizierung) may prevent decay as effectively as (a) or (b), but not as well as (c). LOUIS E. WISE

Concretes. M. MONNOYER and H. T. E. KIRKPATRICK (trading as Soc. LA RHOUBENITE). *Brit.* 161,061, Mar. 17, 1920. A road covering and like compn. of the kind described in 4349, 1914 (*C. A.* 9, 2140), consists of concrete and 0.6-1.0% of cork, sawdust, or other fibrous material impregnated with tar and bitumen. In an example, a mixt. of 8-12 kg. sawdust, 6-9 kg. tar, and 0.120-0.180 kg. of rock asphalt bitumen is added to a concrete consisting of 400-500 kg. of cement, 600 kg. of sand, 1,200 kg. of stone, and H_2O .

Concretes. F. J. COLLINGWOOD. *Brit.* 160,974, Jan. 13, 1920. "Devon red earth" derived from red sandstone, or the conglomerate associated therewith, or mixts. of the two is screened to remove stones, mixed with lime or cement, moistened with H_2O , and molded into bricks by manual or mechanical power and allowed to set. The bricks may have a facing of waterproofing material. Walls may be built *in situ* by ramming the compn. between shuttering.

Slaking lime. E. R. SUTCLIFFE. *Brit.* 160,556, Dec. 22, 1919. Lime or the like is fed by a hopper into the first of a series of parallel cylinders through which it is propelled by stirring and conveying vanes. H_2O is sprayed upon the lime in the cylinder from a pipe parallel with the axis, and this cylinder is preferably provided with a H_2O jacket. The other cylinders are provided with steam jackets preferably of semicircular form so as to enclose the upper half only. The cylinders are connected at each end by cylinders forming vertical shafts which are provided alternately with segmental plates and segmental gratings so as to allow the material to be traversed in the desired path. A suitable construction is specified.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Relativity and the problems of coal. Low-temperature carbonization and smokeless fuel. HENRY E. ARMSTRONG. *J. Roy. Soc. Arts.* 69, 385-407(1921).—The paper conveniently divides into 2 parts. The first is an arraignment of the British people for its waste in the use of its most priceless possession—coal. Woven into this is a plea for a sound doctrine of *relativity* in our sublimary affairs, a true doctrine of

relativity which should enable nations to define and preserve their respective positions. This part of the paper cannot be adequately abstracted but is well worth the reading by all students of fuel problems. The second part gives the development of the coalite process beginning with the expts. of Parker and Salisbury-Jones in 1905. The 3 main defects of the large inverted V-shaped ovens were: (1) uneven heating due to clogging of the burners with tar from the Mond producer; (2) trouble in discharging and cooling the coalite, which must not be quenched with water but cooled out of contact with air; and (3) leakage of air into the bottom of the oven, which caused overburning of the charge and small yields of tar. Under a new engineer, T. M. Davidson, these difficulties were overcome and the new plant operating since Nov. 1920 is a practical success. The ovens, 11" wide, have vertical walls and suspended in them are 2 cast-iron plates in which are drilled numerous holes. Coal is filled between the sides of the oven and the plates. The width of the charge is regulated by the position of the plates. During carbonization the plates exert pressure on the coal but the volatile matter can readily escape through the holes into the space between the plates. After carbonization the charge is released by moving the plates away from the coked mass. The oven is built over and in direct connection with an air-tight chamber cooled with water on each side. Into this chamber the charge is dropped and from it the cooled coalite is raked through a door at the front. During carbonization the charge is held up by an iron plate closing the bottom of the oven. This plate is pivoted so that it can be drawn aside for discharging. Carbonization takes place in 5 to 8 hrs. depending upon the thickness of the charge. The coalite is said to be a perfect product. The tar, which A. proposes to call coal-oil, yields cresol, motor spirit and a fuel oil which is well within the Admiralty specifications. In the discussion the main objections were the absence of a satisfactory balance sheet and the failure to refer to other processes of low-temp. carbonization.

J. J. MORGAN

The evolution of the recovery and treatment of the by-products of the carbonization of coal. CH. BERTHELOT. *Chimie & industrie* 5, 384-97, 508-17(1921).—Description of the principal modern methods for the recovery and treatment of tar, NH_3 , S, and benzenes from the products of the carbonization of coal.

A. P.-C.

Extraction and briquetting of lignite. JEAN G. VERDIER. *Rev. ing. index tech.* 27, 343-53, 407-17(1920); 28, 9-16, 137-48(1921).—Description of the process of extrn. and briquetting of lignite and of the equipment used.

A. P.-C.

The technic of industrial heating. EMILIO DAMOUR. *Chimie & industrie* 5, 271-80(1921).—Upper, lower, and industrial (obtained by means of a const. pressure bomb calorimeter in which the air is introduced at 15° and the products of combustion taken out at 100°) calorific values, and temp. of combustion are defined and their importance is discussed. The total heat of a gas at T° (abs.) is given by Mallard and Le Chatelier's formula, $Q = a(T/1000) + b(T^2/1000^2)$, in which a is a const. which is equal to 6.5 for all gases, and b a const. which has different values for different gases (perfect gases 0.6, H_2O 2.9, CO_2 3.7, CH_4 6). The economic value of a fuel, that is its value under given working conditions, is discussed: it is the price which can be paid for a new fuel which is substituted for a fuel which is already being used in a given furnace.

The "total C" method of establishing the thermal balance is as follows: The coal used during the test is sampled and analyzed for H_2O , H, total C, ash, and lower and industrial calorific values by the Mahler bomb calorimeter. The ashes and clinkers are sampled and the total C is detd. The C actually burned is calcd. from the 2 analyses. The flue gases are sampled continuously during the test. The vol. of gases (in cu. m.) per kg. of fuel, can be calcd. from the analysis of the gases and the amt. of C in the fuel which is actually burned. The temp. of the gases is noted (or preferably registered) at frequent intervals to obtain fair av. as they leave the hearth, as they leave the boiler.

as they enter the economizer, and at the base of the stack. This method is claimed to be more accurate (the max. error being 2.5-4%), simpler, and quicker than the usual method of weighing and analyzing the coal and ashes and of weighing the feed water.

A. P.-C.

Forethoughts on gas engineering. Edw. L. RIEHA. *Gas Age* 47, 472-7(1921); *Gas Record* 19, No. 11, 11-16(1921); *Am. Gas J.* 114, 511-13, 520-24(1921).—The gas industry is faced with serious problems which call for radical changes in the methods of manuf. if it is to keep pace with the needs of the times. R. concludes that a satisfactory solution of the problem will be found by manufacturing and delivering a gas of 400 B. t. u. produced by a system of complete gasification. He cites English experience to show that such a gas is as serviceable as one of higher calorific value and can be distributed at a lower cost to the consumers. By such a system 70-80% of the total efficiency of the coal can be utilized instead of the usual 20-25% now realized. It will not only enhance the use of gas for industrial fuel but will also be a great factor in conservation of coal resources.

J. L. WILEY

Gas by-products as raw material. R. S. McFRIE. *Gas Age* 47, 455-9(1921); *Am. Gas J.* 114, 523-31(1921).—Gas plants should recover the by-products from the manuf. of gas not only for the profit to themselves, but also for the greater purpose of furthering the independence, progress and security of American industry. J. L. WILEY

Plant for recovery of motor benzene in the city gas plant at Linz. PHILIPP IMHOF. *Z. Ver. Gas-Wasserfuch.* 61, 29-30(1921).—About 80 kg. of motor benzene are recovered per day from 3200 cu. m. of coal gas. The benzene is very pure, more than 85% distg. over at 90° and the remainder up to 110°. Of great importance toward a successful operation are: The installation of a good reducing valve in the steam line to keep the pressure always at the same height independently of the variations of pressure in the stiller; the use of a steam as dry as possible; and a gas carefully freed of NH₃ before the benzene washing to prevent absorption of water from the wash oil and its subsequent presence in the benzene.

J. L. WILEY

Production of water gas in horizontal retorts in the city gas plant at Vienna-Neustadt. FRANZ HERGLTZ. *Z. Ver. Gas-Wasserfuch.* 61, 28-9(1921).—Steaming is practiced by passing the steam into the retort through a 3/4-in. pipe piercing the middle of the side of the retort head and then bending to the bottom of the retort, this being done to avoid stoppages of the steam pipe connection when withdrawing it for pushing the coke. The pipe extends the length of the retort, the steam being emitted through a number of holes in the pipe. The daily production of gas from a block of eights has been increased thereby about 220-250 cu. m. with a consumption of fuel for heating of about 24-25%, whereas previously it was 34-36%. Six hrs. of gas making, and 2 hrs. of steaming are practiced. The mixed gas has a heating value of 4500 cal. The cost per cu. m. of the water gas is 4 kronen.

J. L. WILEY

New type of Congdon standpipe. R. C. CONGDON. *Gas Age* 47, 460-1(1921); *Gas Record* 19, No. 11, 23-4(1921); *Am. Gas J.* 114, 543-4(1921); cf. *Proc. Am. Gas Inst.* 9, 478-98(1914).—C. describes some improvements made since 1913 in the Congdon scrubber. During this time it has not been necessary to clean the standpipes. The advantages of this type over the old style standpipes are: the heavy continuous work of keeping standpipes open is done away with; the expense and labor of pulling pitch from the hydraulic main is obviated, and the danger of explosions, overflowing of tar and of the main losing its seal is avoided; the valve inside the standpipe is a much more positive gas cut-off than the seals of the dip pipes; no provision is required for taking care of the tar and liquor overflow, as is usual with any sealing system on top of the bench; the retort house is much cooler; and operating without seal, more even pressure conditions in the retorts are obtained, and the yield of gas is increased. J. L. WILEY

How can we increase our capacity of water gas sets? J. H. TAUSIG. *Gas Record* 19, No. 11, 21-2(1921); *Am. Gas. J.* 114, 537-8(1921).—T. outlines how production of water gas sets may be increased by utilizing to the full existing app. with the least expenditure, and discusses certain fundamentals that affect the capacity such as: area of grate; rate of blast; rate of steaming; character of fuel; facilities for cleaning fires, for operating valves, and for coaling; and resistance to gas make. J. L. WILEY

Results with Thomas meter. W. H. JEFFERSON. *Gas Record* 19, No. 11, 31-2(1921); cf. *C. A.* 14, 2851.—Various tests of this meter for large quantity gas measurement show very accurate results. The av. of 17 tests against a wet meter was 0.04% and of 22 tests against a storage holder 0.37%. The distinctive feature of this meter is that it gives the results directly in standard cu. ft. units without correction for temp., pressure, etc. J. L. WILEY

Advances in tar distillation. BERTHOLD NEUMANN. *Z. angew. Chem.* 34, Aufsatztteil, 193-5(1921). E. H.

Nitrogenous bases of coal tar. A. MAILHE. *J. usines à gaz* 45, 162-4(1921).—Properties, extrn., and uses of the pyridine, quinoline and acridine bases are discussed. J. L. WILEY

Benzene recovery by the Bayer method. A. ENGELHARDT. *Gas und Wasserfach* 64, 205-6(1921); *J. usines à gaz* 45, 170-1(1921).—German gas works are taking up the Bayer method (D. R. P. 310,092 (*C. A.* 15, 1031)) developed by F. Runkel, of absorbing benzene from gas by means of wood charcoal. The absorption is very nearly complete, until 1 kg. of charcoal has absorbed 400 g. of light oils. It absorbs also CS_2 , naphthalene and tarry substances, the latter being washed out of the pores with wash oil. A succession of carbon filters fractionates the condensates to a large extent. The method has been in use for some time in cellite, celluloid and powder factories for recovering ether, alcohol, acetone and benzene. Benzene yields may be increased 10-20% by this method. J. L. WILEY

Dry coke quenching. ANON. *Gas und Wasserfach* 64, 204-5(1921); 1 fig.—Sulzer Bros. Mfg. Co. of Winterthur is constructing and installing plants for the dry quenching of coke. It does away with the disadvantages connected with water quenching, such as loss of heat, cracking of the coke and consequent production of breeze, and corrosion of the metal parts of the plant by the steam. The hot coke is discharged into an hermetically closed holder lined with fire-bricks and sepd. from a vertical water-tube waste-heat boiler by a fire-brick wall. A fan at the bottom of the shaft drives the hot gas of the coke upward through the coke and through a flue connected with the boiler compartment. Aside from leakages, air is admitted only during the charging and emptying of the holder; the O present is consumed with the first passage of the hot coke, leaving an inert gas consisting essentially of CO_2 and N. The coke becomes cooled from about 1100° to about 250° ; the heat produces in the boiler about 300-420 kg. of satd. steam per ton of coke, or a saving of heat of nearly 250 cal. per kg. of coke. The operation is practically automatic and requires a minimum of labor. J. L. WILEY

Condensers in coke-oven plants. E. ORÉ. *Technique moderne* 12, 7-11(1920).—A brief discussion of the defects of various types of condensers. A. P. C.

Wood waste (BOAS) 22. Industrial alcohol (BLANCHET) 16. Central bureau for improving fuel conditions established by the Association of German Glass Manufacturers (CLARK) 19. The modern gas producer (BREMEN) 10.

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GRAY, THOMAS AND KING, J. G.: *The Assay of Coal for Carbonization Purpose: A New Laboratory Method*. London: H. M. Stationery Office. 13 pp, 6d.

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SEUFERT, F.: *Verbrennungslehre und Feuerungstechnik*. Berlin: Julius Springer 128 S. M 15. For review see *Arch. Wärmewirtschaft* 2, 58(1921).

SMITH, THOMAS BIDDULPH: *Coke-oven and By-products Works Chemistry*. Philadelphia: J. B. Lippincott Co. 180 pp.

Fuel. L. W. BATES. *Brit.* 161,929, Dec. 24, 1920. Fuel that can be treated as a liquid and also be stored under H_2O and which consists of 10-40 parts of coal, anthracite, coke, peat, lignite, pitch, or other solid carbonaceous substance and 90-60 parts of oil, tar, or other liquid hydrocarbon, is prepd. by pulverizing the coal, etc., in liquid hydrocarbon of, or heated to 150-220° F. so as to be of low viscosity, and afterwards blending in other hydrocarbon or an alc. if not used in the pulverizing process. The stability of the composite is increased by one or more of the following measures:— (1) Raising the viscosity; (2) adding buoyant particles; (3) adding protective colloids such as lime-rosin soap; (4) adding agents that peptize the coal particles; e. g. creosote, water-gas tar, naphthalene; (5) removing ash from the coal by froth or other flotation treatment of the initially pulverized mass; excess oil is removed if necessary, as by centrifuging. In an example, 15 parts anthracite, 15 parts bituminous coal, 15 parts water-gas tar, and 25 parts fuel oil are combined in a Smidth's pulverizing mill at 200° F. for about 20 mins., and the paste produced is heated and beaten up with 30 parts fuel oil for about 40 min. This product is stable for a mo.

Hydrocarbons. J. A. VILLE and H. PLATON. *Brit.* 160,789, March 24, 1921. Carbonaceous materials, such as coal, peat, or liquid hydrocarbons, such as star oils, are heated under pressure with an alkali in the presence of H to obtain hydrocarbons of low b. p. The formation of the liquid hydrocarbons may be effected in the presence of H_2O or of H_2O and H and the higher the pressure used the lower the temp. required as at 700°, 15-25 atms. pressure is necessary as against 150-200 atms. at 400°. Solid materials are emulsified or mixed with sufficient oil or alkali soln. to make them semi-liquid. A suitable construction is specified.

Gas manufacture. A. A. MACINTOSH. *Brit.* 161,527, Apr. 8, 1921. This invention relates to the destructive distn. of coal and appears to comprize an improved process or app. or both.

22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The technical analysis of petroleum. I. LAZENNEC. *Age de Fer* 37, 1058-60 (1921).—Brief outline of the detns. which should be carried out on crude petroleum, "benzene," and kerosene. A. P.-C.

The refining of crude petroleum. ALBERT H. LOW. *Colo. School of Mines Quarterly* 15, No. 2, 9-10(1920).—A non-technical description of the refining of crude pe-

roleum. In brief are discussed the impurities, classes and uses of crude petroleum followed by a description of the products obtained and methods of refining. Steam and fire distn., chem. refining methods and the recovery and purification of paraffin are treated. An interesting chart or "flow sheet" showing all the steps from the crude oil to the numerous finished products of the petroleum industry is included.

H. S. BAILEY

Petroleum under the microscope. J. SCORR. *Petroleum World* 18, 20-2(1921).—Sulfonic acids very frequently remain in petroleum owing to insufficient washing during the refining. This may be readily tested for by heating with an equal vol. of freshly distd. $C_6H_5NH_2$. This will produce a sulfate from any sulfonates present and cause a turbidity. Three microphotographs of salts formed by the interaction of $C_6H_5NH_2$ and sulfonic acids are shown. **The oil-nitrogen problem.** *Ibid* 125-6.—N is seldom present in petroleum and yet it is still to be found in the natural gas which exudes from oil fields, in some cases comprizing 80% of the gases. Assuming that petroleum is derived from animal sources, then bacteria could have decompd. the remains deep in the earth with the liberation of NH_3 and its subsequent transformation into nitrites, nitrates, and finally free N. Even now $(NH_4)_2SO_4$ is commonly found in many oil wells. *Ibid* 160-1.—Mineral oils stored in cans and bottles in which used portions have been replaced by fresh ones frequently show a very dirty deposit at the bottom. *The Beggiatoa alba*, *Thiothrix* and *Thiodictyon* (all species of *Trichobacteria*) can ext. the S and deposit it in themselves as minute granules of solid matter. Since finished petroleum oils contain more or less S, then there is no reason why microorganisms cannot grow in them. Since it is known that CH_4 may be produced by bacterial action, then one can conclude that germs have had and still have considerable influence in petroleum oils, both crude and refined.

R. L. SIBLEY

Formation of petroleum from fish oils. Origin of Japanese petroleum. KIUREI KOBAYASHI. *J. Chem. Ind. Japan* 24, 1-26(1921).—A method has been discovered for prepg. petroleum from the fish oils by dry distn. of the oil with acid clay. K.'s investigation was prompted by 4 outstanding facts: (1) There is a topographical relationship between the distribution of Japanese petroleum oil and the occurrence of acid clay; (2) most Japanese petroleum in nature occurs admixed with sea H_2O ; (3) when acid clay and neutral salts are heated together free acids are formed; and (4) certain fish oils, like the liver oil of certain sharks, contain hydrocarbons, e. g. squalene. Exptl. methods are as follows: 4 l. of herring oil having d. 0.9214 and sapon. no. 187.7 were mixed with 4 kg. of finely powdered Japanese acid clay in an iron retort and another 4 kg. of the clay were added to cover the mixt. By heating this mass under ordinary pressure at 400° , K. obtained 2 l. of crude oil and 1800 cc. of H_2O . The distillate had a greenish fluorescence and petroleum odor, the color changing gradually to brown on standing. It had d_{15} 0.8160, sapon. no. 15.1, and absorbed 14.5% of concd. H_2SO_4 . Fractional distn. of it gave the following result.

Fraction at C° .	% by vol	Density.	Color.
45-75	8	0.6885	water white
75-106	8	0.7346	" "
100-125	6	0.7472	" "
125-150	8	0.7573	" "
150-175	8.8	0.7815	yellow white
175-200	8	0.8055	" "
200-225	10	0.8185	yellow
225-250	8	0.8325	"
250-275	9.2	0.8474	"
above 275	26		yellow brown

These distillates can be classified into 3 groups: (1) light oil (below 150°) 30%, d. 0.7284; (2) illuminating oil (150–275°) 44%, d. 0.8173; and (3) neutral and heavy oil, 26%, d. 0.8868. From the light oil, K. obtained a naphtha by the customary refining method. From the illuminating oil, a lamp oil was obtained by heating with NaOH in order to remove petroleum acid and some fatty acid and by washing with concd. H_2SO_4 , NaOH, and hot H_2O . This refined fish-naphtha (water white, d. 0.7310, no sapon. no., no alc.) gave the following fractions on distn.:

Fraction at C°.	% by vol.	Density.
45–75	5.5	0.6902
75–100	23.9	0.6963
100–125	32.1	0.7296
125–150	22.9	0.7551
above 150	15.6	0.7961

The gasoline prepd. from the fish oil contains more unsatd. hydrocarbons than that of natural crude petroleum. The refined fish illuminating oil (pale yellow, d. 0.8264, no sapon. no.) gave the following fractions.

Fraction.	% by vol.	Density.
under 150°	2	—
150–175°	9.5	0.7852
174–200°	16	0.7954
200–225°	19	0.8098
225–250°	22	0.8224
above 250°	31.5	0.8534

Natural illuminating oil from Hōden Oil Co. Japan, "Aohōgioku," gave the following distn. fractions:

Fraction.	% by vol.	Density.
under 150°	6	—
150–175°	24	0.7828
175–200°	30	0.7982
200–225°	30	0.8112
225–250°	12	0.8330
above 250°	8	0.8602

This shows that K. obtained 80% of illuminating oil from fish oil which is exactly identical with com. kerosene oil. This method gives acrolein, CO_2 , sol. fatty acid, some higher fatty acid, petroleum acid and hydrocarbon. The petroleum acid is a reddish yellow liquid, having d. 0.9023, neutralization value 287, Wjjs 2.92. It is probable that the hydrocarbons are mostly of the naphthalene and olefin series. The theory of this method is given in detail. K's theory of the origin of the Japanese petroleum oil is as follows. Japanese petroleum must have originated from marine animals. After putrefaction in which the protein of fish was hydrolyzed, the oil was sapond. and cracked in the presence of the colloidal acid clay on the strata of fish remains. The hydrocarbons of the naphtha series (Higashiyama, Nishiyama and Niitsu oil), are probably derived from low unsatd. fatty acid. Hydrocarbons of the $\text{C}_{16}\text{H}_{34}$ and $\text{C}_{18}\text{H}_{38}$ series (Kitano, Hara, Ojiya oils) are from highly unsatd. fatty acid. Similar exptl. results were obtained from other fish oils (sardine and salmon oils).

S. T.

Examination of hydrocarbon oils. GUY L. RADCLIFFE. *J. Soc. Dyers and Colourists* 37, 51–5(1921).—The paper is a report of a descriptive lecture on the importance of examg. hydrocarbon oils for lubrication, fuel or insulating purposes. The usual methods of physical examn., the compn. of the oils and some changes in compn.

in use (notably oxidation with production of aldehyde and acidic compds.) were discussed.

A. K. JOHNSON

Burning petroleum. II. E. C. BOWDEN-SMITH. *Petroleum Times* 5, 609-10 (1921); cf. *C. A.* 15, 2176.—Burners are described for the burning of fuel oil and are illustrative of the conoidal spray, the spherical jet and a tongue or sheet of flame.

R. L. SIBLEY

The shale industry of Resiutta. COSSERTINI GUIDO. *Boll. chim. farm.* 59, 245-6 (1920).—The Resiutta mine on Mt. Salvotti furnishes an oil-bearing shale from which the following products are manufd.: for pharmaceutical use, ichthyol, pyridine and quinoline bases; for industrial use, volatile unsatd. hydrocarbons for solvents, turpentine substitutes for varnish, and heavy oils; by-products are NH_3 , SO_2 , pyrrole and $(\text{NH}_4)_2\text{SO}_4$.

A. W. DOX

Bituminous shale (kukersit) of Esthonia. ANON. *Shale Rev.* 8, No. 4, 5(1921).—The deposit extends from Baltic Port to Narva, with an av. thickness of 1.75 m., and a sp. gr. of 1.3. The analysis is: org. material 55.5%, SiO_2 13.6%, Fe_2O_3 2.3%, CaCO_3 17.0%, Na_2O and K_2O 0.2%, water 1.2%. The org. material consists of C 70.52%, H 7.2%, N 0.30% and O 21.98%. Upon distn. the shale yields oil and tar 29.07%, gases 21.33%, coke 7.64%, ash 40.15%, H_2O 1.83%. The raw shale has a fuel value of 4200-5500 cal. Fractional distn. of the crude oil yields benzene 20%, lighting oil 20%, lubricating oil 20%, tar or pitch 40%. The shale is at present being used for (1) distn. to obtain oils, (2) in gas works for production of gas, (3) mixed with pulverized coal for cement burning, (4) for steam-raising purposes in locomotives and steamers, and (5) for domestic fuel use.

A. H. HELLER

Bituminous schists of the Non valley in Trentino. ANGELO COPPADORO. *Giorn. chim. ind. applicata* 3, 3-9(1921).—These schists are very rich and extensive. They belong to the same geological stratum as those of Seefeld in the Tyrol. On dry distn. the schists yield an oil rich in S, which contains pyridine bases and non-satd. compds. possessing strong antiseptic powers. The yield in oil is 15% on the av. Ammoniacal liquors are formed containing 5-10 g. NH_3 per l. Combustible gases are produced amounting to about 6.5 cu. m. per cwt. schist.

ROBERT S. POSMONTIER

Wood waste. I. H. BOAS. Australia Inst. Sci. Ind., *Bull.* 1921, No. 19, 82 pp.—A report on the methods of utilizing wood waste as fuel for the production of producer gas, potash, paper, nitrocellulose, viscose, wood wool, etc. Emphasis is given to the results of the U. S. Forest Products Lab. About a third of the report is devoted to a detailed discussion of wood distn. some new exptl. data being included. Tests have been carried out on Australian hardwoods, including jarrah, karri, and wattle. The last compares favorably with oak as raw material in wood distn. The tabulated results of a series of dry distns. using N. S. Wales hard and softwoods (previously published in the New S. Wales Reports of the Forestry Commission 1918-19) are given in B.'s monograph, and the possibilities of establishing a wood-distn. industry in Australia are outlined. The chem. utilization of sawdust in the manuf. of oxalic acid, carbide, gas, etc., is touched upon, and the manuf. of EtOH from wood waste is fully discussed. An appendix gives a bibliography on wood distn.

L. E. WISE

Wood distillation as a national industry. E. C. POWELL. *Chem. Age (London)* 4, 552-3(1921).—Discusses the prospect of establishing wood distn. as a national industry in England. No new data are included.

LOUIS E. WISE

Relations between the fat and asphalt industries (MARCUSSON) 27. Theory on the origin of hydrocarbons (FAIRCHILD) 8. The origin of petroleum (CARMOUD) 8. Geology of the Peruvian oil fields (MARSTERS) 8. Mid-continental geological studies (AURIN, et al.) 8.

Purifying oils. A. J. PARIS. Brit. 161,253, Jan. 2, 1920. Petroleum and analogous distillates are purified by compressing their vapor, mist, or spray with glycerol, turkey-red oil, castor oil, mineral lubricating oil, or other liquid purifying agent having no chem. action, in presence of oxygen-free gas such as H, N, coal gas, or natural gas. A suitable app. is specified.

Saccharifying wood, etc. S. F. ACREE. Brit. 160,776, March 18, 1921. Wood and other vegetable substances such as cottonseed hulls, corn cobs, shells of various sorts of nuts, ivory-nut meal, etc., are hydrolyzed with acids at a temp. preferably between 70° and 100°, and in no case above 140°, to give sugars. The process is especially described with reference to the treatment of the wood of the western larch to produce galactose. In this case, the hydrolyzing soln. may be an acid soln. containing acid 0.25-2.5% of the dry wt. of the wood to be treated. The operation preferably takes place in a diffusion battery, through which the soln. is passed in counter-current to the wood. Before it is placed in the vessels the wood is heated to the temp. at which it is to be treated. After the soln. is withdrawn from a vessel, the vessel may be evacuated before the introduction of another charge of soln. to evap. the liquid left in the wood and to open out the wood. The wood after treatment is used for fuel or for making paper, millboard, etc. Several hydrolyzing agents are mentioned. If it is desired to retain the galactose as such, H_2SO_4 may be used and afterwards removed by pptn. with CaO; this is stated to clarify the liquid, which may be afterwards cond. The galactose may be used with cottonseed cake to make food for animals, or it may be fermented to ethyl alc. If it is desired to make paper pulp, etc., from the residues, $Ca(HSO_3)_2$ may be employed for the hydrolysis. The galactose may also be oxidized to mucic acid (cf. following patent). The mother liquor from the mucic acid may be used as the hydrolyzing agent. If it is necessary to conc. the galactose soln. the stronger mineral acids may be neutralized with alkalis, without neutralizing the organic acids, to prevent corrosion of the app. The liquor contains, besides galactose, unchanged galactan, other sugars, and tannin. When corn cobs are treated the chief product is *l*-xylose, which may be oxidized to trihydroxyglutaric acid.

Mucic acid, etc. S. F. ACREE. Brit. 160,777, March 18, 1921. Mucic acid is obtained from wood sawdust, particularly that from the butt portion of western larch, by treating it with a hydrolytic reagent, oxidizing the resulting galactose soln. and crystg. out the mucic acid; oxalic and saccharic acids are obtained as by-products. The sawdust may be digested three or more times with a dil. inorg. acid, or with the mother liquors containing HNO_3 , nitrous, and oxalic acids, etc., from the mucic acid crystn., but preferably by 2% H_2SO_4 , the same liquid extg. successive quantities of sawdust in the usual manner. The sugar soln. may be cond., the strong acids partially or wholly neutralized and the oxidation effected electrolytically, by the action of O in the presence of ultraviolet light or by various oxidizing agents, particularly air with oxides of N, or HNO_3 ; the action in the latter case is accelerated by the addition, if necessary, of nitrous acid. The oxidation process may be made continuous by allowing the sugar and HNO_3 soln. to flow down a jacketed coil at a suitable temp. When the soln. is cooled, mucic acid seps. out and is removed; the mother liquors may be used in the extn. of the sawdust or may be repeatedly used to oxidize more sugar until the content of $(HOCO)_2$ and saccharic acid is sufficient to permit of the isolation of these acids by their Ca salts. The oxides of N resulting from the oxidation by HNO_3 may be oxidized by air in the presence of a catalyst such as "silica gel" or Pt on a cellular filler and absorbed to give HNO_3 in the usual manner; a complete cycle of operations is thus attained. The mucic acid may be purified by forming the NH_4 or other salt, decolorizing, and repptg. by H_2SO_4 . The NH_3 may be recovered by distn. with CaO and absorption in crude mucic acid, or as $(NH_4)_2SO_4$. Mucic acid may be used as a substitute for cream of tartar and tartaric and citric acids in baking powders, soft drinks, cleaning compds., flavoring

materials for ices, candies, and jellies, mordanting, and electroplating baths. The spent sawdust may be used as fuel or for making cellulosic products such as pulp.

23—CELLULOSE AND PAPER

A. D. LITTLE

New institute for the chemistry of cellulose at the Technical High School at Darmstadt. ANON. *Svensk Pappers-Tid.* 24, 174(1921).—Announcement is made of the opening of a new sep. institution for chem. research on problems connected with the manuf. of paper pulp. This institute is made a part of the Technical High School in Darmstadt and follows the lines laid down by the Committee of the Society of Swedish Paper and Cellulose Engineers. Cf. C. A. 15, 1991. W. SEGERBLOM

The heat problem in the cellulose industries. G. SUNDBLAD. *Svensk Pappers-Tid.* 24, 148-58(1921).—S. has studied 2 sulfite plants and 1 sulfate plant and presents in much detail the manuf., use, loss and saving of heat in the processes. He gives his results in 28 full diagrams and charts. His diagrams of a sulfite cellulose plant and of the old and new systems for sulfate cellulose plants are particularly commendable. Enthusiasm for this problem may easily lead to misdirected effort. A wise installation of heat-saving devices may easily wipe out the necessity for importing fuel into Sweden. W. SEGERBLOM

Cotton linters as raw material for the celluloid industry. HENRI BARTHÉLEMY. *Rev. prod. chim.* 24, 301-6(1921).—Description of the purification and bleaching of the linters, and of the equipment required. A. P.-C.

Papyrus pulp. RAYMOND FOURNIER. *Papeterie* 43, 386-92(1921); cf. C. A. 14, 3791.—Description of papyrus, of its micrographic characteristics, and of the method of prepn. of the paper pulp. The fibers are fine, regular, cylindrical, but rather short, the extremities being pointed and sometimes bifurcated. They are 0.5-3 mm. long (av. 1.80); 0.008-0.025 mm. in diam. (av. 0.012). The felting power (length/diam.) is 150, which is rather good. The lumen goes right through the fiber and is about one-third of the diam. The fibers are colored light yellow by I and H_2SO_4 , darker yellow by chloriodide of Zn and aniline sulfate, and red by phloroglucinol. The purified cellulose fibers are colored violet by chloriodide of Zn. It also contains variously shaped thick-walled cells, which constitute the greater portion of the spongy tissues of the pith; these cells, which have concave sides, are characteristic of papyrus pulp. There are also a few saw-tooth-shaped vessels and cells. Papyrus may be treated by $Ca(OH)_2$ or NaOH in the cold, but the regular soda process is the one best suited; and by varying the conditions of working (% NaOH, time and pressure of cooking) different qualities of pulp are obtained suitable for practically all kinds of papers. Encouraging tests have been carried out with a view to the prepn. of the pulp without pressure cooking. The stems are crushed between rollers, boiled for a few min. in water, NaOH is added, and the whole boiled some time longer. The material is then defibered and washed thoroughly. By using 3-14% of NaOH (on the wt. of the dry raw material) yields of 45-28% of pulp were obtained, and the total time required for the treatment (exclusive of drying) was never more than 2 hrs. The pulp is fairly easily bleached to a cream color with a fairly low consumption of NaOCl. A. P.-C.

Bagasse paper. CH. GROUD. *Papier* 24, 226-8(1921).—Brief discussion of the suitability of bagasse as a source of paper. A. P.-C.

Value of the paper pulp exported from Sweden 1913-1920. ANON. *Svensk Pappers-Tid.* 24, 177(1921).—In table form are given for the years 1913-1920 the number of tons of paper pulp exported from Sweden, its value in crowns and its value

in crowns per ton for wet and dry mechanical paper pulp, also for bleached and for wet and dry unbleached sulfite cellulose and sulfate cellulose. W. SEGERBLOM

Baobab bark. L. MATROD AND F. MORHAU. *Bull. de l'agence générale des colonies* 13, 1065(1920); *Bull. Imp. Inst.* 18, 560-1(1920).—The bark was submitted to microscopical and microchem. examn. and technical trials were made to det. its value for paper manuf. The raw material consisted of reddish white ribbons of the inner bark which had been neither retted nor combed. On treatment with NaOH soln. a yield of 33% pulp was obtained. The pulp furnished a soft white paper with a satisfactory resistance to tension, tearing and rubbing. R. L. SIBLEY

Electric power in the paper industry. H. W. ROGERS AND E. E. WARNER. *Gen. Elec. Rev.* 24, 559-62(1921).—A discussion of the applicability of elec. power to the paper industry. The paper machine and its drive, consuming about 75% of the total power, should be a sep. unit, to insure speed regulation, flexibility of control, and uninterrupted service. The necessity of having steam prevents complete electrification unless live steam is used. Eleven boiler-h.p. per ton (909 kg.) of paper is sufficient; while the average load, with properly applied motors is about 80% of the connected h. p. with a maximum demand little greater. W. H. BOYNTON

Wood waste (BOAS) 22. Lignin substance (MELANDER) 11D. The separation of plant fibers by bacterial action (MICOL DE PORTEMENT) 25. The nature of the swelling process (KNOEVENAGEL) 2. Treating fibers (Brit. pat. 161,600) 25.

HAGGLUND, E.: Die Sulfitablaue und ihre Verarbeitung auf Alkohol. Braun-schweig; Vieweg u. Sohn. 82 S. M 6. For review see *Schweiz. Chem. Ztg.* 25, 1(1921).

WORDEN, E. C.: *Technology of Cellulose Esters*. Vol. 1. (Five parts). London: E. and G. N. Spon. 3087 pp. £10. 10s. net. (Cf. C. A. 10, 1789.)

Cellulose butyrates; plastic compositions; lacquers; dopes. A. D. LITTLE, Inc. Brit. 161,564, March 9, 1921. Cellulose butyrate is prepd. from cellulose by treatment with butyric anhydride in the presence of butyric acid and a catalyst such as H_2SO_4 . It is proposed to subject the cellulose to a preliminary treatment with the catalyst; as a solvent is used butyric acid or HOAc preferably containing a small proportion of H_2O , and in the case of butyric acid a solvent such as methanol, ethyl or butyl alc., acetone, diacetone alc., or ethyl acetate, to prevent the sepu. of the bath into layers. The excess of the impregnating bath is removed, and the cellulose treated with the acidulating bath until a product of the desired soly. in alc.-benzene is obtained and this may be accelerated by the addition of a small proportion of H_2SO_4 at a suitable stage in the esterification. The ester is sol. in alc.-benzene, acetylene tetrachloride, acetone, ethyl acetate, carbolic acid, hot alc. and benzene, alc.-carbon tetrachloride, and hot solvent naphtha. It may be used in the manuf. of plastics, transparent sheets and films, artificial silk, lacquers, dopes, and artificial leather.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Production of explosives in Germany during the war. GINO GALLO. *Giorn. chim. ind. applicata* 2, 625-37(1920).—Monograph. The subjects considered are: HNO_3 , H_2SO_4 , progressively explosive powders (nitrocellulose powders, nitroglycerin powders, NH_4NO_3 powders), crashing explosive powders. Methods of production are also given, as well as compns. of formulas of the various powders and their properties.

G. gives the following two formulas of smoke-producing substances employed largely by the Germans: (1) $\text{KNO}_3 = 33\%$, $\text{Zn} = 60$ and $\text{S} = 7$; (2) red P = 50, metallic As = 50.

ROBERT S. POSMONTIER

Some properties of tetranitroaniline (TNA). B. J. FLÜRZCHIM. *J. Soc. Chem. Ind.* 40, 97-107T(1921).—The article deals in its major divisions, with the constitution, reactions, d., color, stability, reactivity, physiol. properties, power, sensitizing properties, and manuf. of TNA, the data being drawn from the reports of a large number of investigators and citations being supported by copious literature references. In 1913, on the basis of results obtained on an exptl. scale, it was stated that TNA possesses valuable properties in a high degree; is a well characterized cryst. chem. compd., neutral, without action on metals; is the strongest solid explosive, has a higher d. than any other purely org. explosive, is non-hygroscopic, does not change on storage, is specially resistant to heat and friction, not over-sensitive to mechanical shock, can be easily detonated by an ordinary detonator even when highly compressed, has a smaller O deficiency than other aromatic explosives, is a very suitable ingredient of explosive mixts., and can be made at a competitive price. All of these conclusions have been confirmed by later developments on an industrial scale. In addition, it has been proved that TNA is not injurious to health, has a higher shattering power than any other explosive, and does not change through moisture during manuf., storage, or use—such change requiring more or less prolonged exposure to a combination of moisture and temp. which both substantially exceed the normal, whereas in practice, where temp. may exceed the normal (in shells, bombs, etc.), moisture does not, and where moisture may be high (in submarine mines, etc.), the temp. is not. Credit is given Americans for the successful development of the industrial production of TNA.

CHARLES E. MUNROE

Some physico-chemical problems connected with the stability of explosives. CYRIL NORMAN HINSHELWOOD. *J. Chem. Soc.* 119, 721-34(1921).—The paper deals with the thermal decompn. of high explosives from the point of view of chem. dynamics. 2,4,6-Trinitrophenylmethylnitroamine (tetryl) and 2,4,6-trinitro-o-hydroxyphenylmethyl-nitroamine were the special subjects of study, the latter being selected because it embodies in one mol. the characteristic groups both of tetryl and of picric acid, and could serve to check Farmer's (*C. A.* 14, 2708; 15, 753) views on the decomp. effect of picric acid on tetryl. The results lead to the conclusion that the gradual decompn. of tetryl, which forms the basis of the standard stability test, is not so profound a change as that taking place when tetryl detonates. It satisfies the laws of a unimolecular, autocatalytic reaction. The autocatalysis is due to the production of picric acid and in presence of added picric acid the reaction satisfies the equation established on this assumption. Trinitrohydroxyphenylmethylnitroamine behaves similarly to tetryl. There is a large increase in the rate of decompn. when it melts. In the molten condition, its decompn. is catalyzed by its own HO group as well as by picric acid. It catalyzes the decompn. of tetryl to the same extent as picric acid. These relations suggest that this is an instance of hydron catalysis in a substance in the fused state. The acceleration in the initial stages of the decompn. of solid tetryl is connected quantitatively with the lowering of the m.p. by the products of decompn. A comparison of the ratio of the velocities of decompn. of solid and liquid tetryl at 120° with that deduced from the latent heat of fusion indicates that the decompn. of the solid is governed largely by traces of residual impurity which cannot be removed by recrystn.

CHARLES E. MUNROE

Transmission of detonation by brisant explosives. EBERHARD KATNER. *Z. ges. Schiess-Sprengstoffw.* 16, 9-10, 25-7, 33-5(1921).—The detonation wave in a mass of explosive sets up a kinetic effect in the surrounding medium, which decreases in intensity and velocity until it becomes merely a sound wave. This wave has the property of initiating a new detonating wave in a similar charge of explosive if its distance from the original charge is not too great. The extent of this max. gap depends

upon the nature of the explosive, as well as on the wt. and dimensions of the charge, and its detn. is an excellent means of measuring the sensitiveness to detonation of an explosive. The *gap test* is made with cartridges of the same explosive, of equal diameter, placed a measured distance apart with their long axes in the same line, the detonator being placed in the end of the transmitting cartridge away from the receiving cartridge. The charges may be placed on the ground or other surface, or suspended in the air. With an explosive composed of 81% NH_4NO_3 , 17% TNT (74–76°), and 2% corn meal, the transmission gap for cartridges of 100 g., 33 mm. in diam. was: (1) suspended in air, 8 cm.; (2) on sand 8.5 cm.; (3) on hard ground 7.5 cm.; (4) on 10-mm. iron plate 8 cm.; (5) tamped in heavy iron pipe 60 cm. The detonator should be inserted in the cartridge no deeper than the length of the Cu shell. If inserted deeper, the gap is shorter, and is shortest when the detonator is inserted the entire length of the cartridge. Photographs of the flash of detonating cartridges show that the detonation progresses most readily in the direction in which it is initiated by the detonator; *i. e.*, the principal component of energy is exerted in this direction. This was proved by tests: (1) A TNT cartridge initiated from the top gave a compression of 2.81 mm. on a 7-mm. Cu cylinder; when initiated from the bottom, only 1.73 mm. (2) A gap test of 7 cm. was obtained with the detonator properly inserted, 5 cm. when inserted to the middle of the cartridge, and only 3 cm. when inserted through the cartridge to its base. In blasting operations the primer cartridge should not be turned so that the detonator points away from the main part of the charge. A No. 8 detonator transmits detonation to the NH_4NO_3 explosive mentioned through a gap of only $\frac{1}{2}$ cm., while a 200-g., 48-mm. cartridge of the explosive transmits detonation to a detonator through a gap of 66 cm., the cap being fastened to the top of a peg in the ground, with its *open* end toward the cartridge. To det. whether the formula $d = m\sqrt{p}$, (where d = distance from the source of explosion, p = mass of explosive detonated, m = constant of the explosive), (cf. *Mem. poud. salp.* 13, 161 (1905)), applies to the transmission of detonation through a gap, a series of gap tests was made with cartridges of the same explosive varying in wt. and dimensions, and the constant m calcd. The gap varied from 1.75 to 11.75 cm., while m was practically const. (av. 1.23). Insensitiveness to detonation and to transmission of detonation usually accompany insensitiveness to shock, but the reverse is not always true. Addition of charcoal to a TNT- NH_4NO_3 explosive increases sensitiveness to shock but decreases sensitiveness to detonation. Ca silicide causes a like effect. This is thought to be due to the fact that the chem effect of these additions is counterbalanced by their mechanical effect. C. G. STORM

Wood waste (Boas) 22.

Explosives. A. G. LOWNDES. Brit. 160,953, Jan. 6, 1920. Initiators of detonation are prep'd. in the form of anhedra, flakes, or thin plates by controlling the structure of crystals produced by pptn. by increasing the d. or viscosity of the liquid in which the crystals are sepd. by means of a non-colloidal soln. which has no chem. or appreciable solvent action on the explosive. *E. g.*, PbN_3 is pptd. by the addition of a soln. of $\text{Pb}(\text{OAc})_2$ contg. NaNO_3 , or by the simultaneous addition of solns. of NaN_3 and $\text{Pb}(\text{OAc})_2$ to a soln. of NaNO_3 . Cf. 142,898 (C. A. 14, 2589).

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Bearing of a synthetic dye industry upon our national welfare. MARSTON TAYLOR BOGERT. Columbia Univ. J. Franklin Inst. 191, 445–72 (1921).—A description

is given of the various org. compds. obtained from benzene, toluene, xylene, naphthalene, anthracene, methylanthracene, phenanthrene, PhOH, cresol, and carbazole. The concluding sections are devoted to an account of the influence of the synthetic dye industry upon the advancement of chemistry, and a statement of what the loss of this industry would mean to the nation.

JOSEPH S. HEPBURN

Testing the fastness of dyed colors to light. H. V. GORDON. *Textile Colorist* 43, 29-33 (1921).—A comparison of the violet C arc, R.U.V. and Hanovia quartz Hg arcs, and Arizona and N. J. sunlight as applied to testing dye fastness shows that the Hg arcs are rapid in effects and satisfactory for a great majority of the dyes; however, the results may be untrustworthy when compared to sunlight. The 2 Hg arcs were similar in character of action, but the R.U.V. was more rapid. The violet C arc results compare closely to sunlight, even more closely than the Ariz. and N. J. sunlight compare with each other. Also the C arc is more uniform, throughout long periods, than the Hg, which loses efficiency rapidly when in use. An exposure of 75 hrs. to the violet C arc, or 60 hrs. to midday summer sun will produce a change in all except the fastest dyes. The samples were studied by comparison and with the Hess Ives tint photometer. Two tables of results upon 63 dyes with the 5 sources of illumination are given. II. *Ibid* 172-7.—The variation in fading effect of the quartz Hg arc on fabrics dyed with different % of dyestuffs is expressed numerically, as obtained with the Hess Ives tint photometer. Exptl. dyeings and measurements show that with the lower % of dyestuffs, the fading is far more rapid than with larger proportions of dyestuff. It is shown that the primary colors of the dyed sample are affected to different degrees, or even in opposite direction, by the action of the Hg arc, and for this reason the study includes measurements of the 3 primary colors and "luminosity" (cf. *C. A.* 15, 947). The several methods of comparison are treated, i.e., for samples dyed with the same % of dyestuff: *a*, the change in a single primary color component for each dye; *b*, the total primary color changes. Or for samples of about equal color intensity: *c*, the change in a single color component; and *d*, the total color changes. The author recommends *c* as the fairest method. The use of the "luminosity" value is not suited to dyes where the numerical color changes may be of opposite sign, as in this case they would tend to neutralize each other, making the dye appear faster than it really is. From the work it is assumed that a 4-fold increase in % of dyestuff multiplies fastness to light by 1.6; 8-fold by 2; and probably doubling the concn. will multiply fastness by 1.25. The lower concns. of dyestuffs could be utilized in testing fastness to light, to reduce the time of exposure necessary. From the data given the approx. algebraic equation $C = kT^b$ has been evolved, to show the rate of destruction of the dye by light, in which *C* is the % of dyestuff present, *T* is the time of exposure to light, and *k* and *b* are consts. derivable for each case from the data.

CHAS. E. MULLIN

Dyeing of indanthrene colors on silk. HERBERT E. SCHROERS. *Textile Colorist* 53, 375-6 (1921).—Formulas and instructions are given, as well as a table showing fastness to H₂O, washing, acid, perspiration, peroxide and light.

CHAS. E. MULLIN

Notes on wool colors fixed through chromium salts. RAFFAELLE SANSONE. *Textile Colorist* 42, 180-1, 248-50, 316-7, 410-2 (1920).—The relative advantages of bottom chroming, top chroming, and dyeing in a bath containing the Cr salt, as well as the value of the various Cr salts for mordanting, are discussed.

CHAS. E. MULLIN

The dyeing of wool and of fur bodies for hat making. J. A. WILSON. *Textile Colorist* 43, 384-6 (1921).—A list of suitable dyes is given.

CHAS. E. MULLIN

Control of acid dyebaths for wool. M. FORT. *Textile Colorist* 42, 241-4 (1920).—A rather brief practical discussion of some of the author's previous work upon the mechanism of H₂SO₄, AcOH, Na₂SO₄, and NH₃ salts in dyeing. Cf. *C. A.* 8, 3370, 3720; 9, 1120, 2710; 10, 2300; 13, 264; 14, 847.

CHAS. E. MULLIN

Some stains in cotton fabrics. A. J. HALL. *Textile Colorist* 43, 400-2(1921).—On cotton dyed with aniline black brown resist stains may be due to acid-forming bacteria in the presence of air. White may be due to traces of alkali in the fabric during dyeing, and blue stains to deposits of Prussian blue. Oxycellulose stains are frequent on basic dyed fabrics, and if such dyes must be used on oxycellulose the cotton should be mordanted with tannic acid and tartar emetic. Heavily or lightly dyed spots may be due to splashes of chem. solns. Pink stains on bleached cotton may be due to aniline vapors when present. Acid may also favor pink stains under certain conditions.

CHAS. E. MULLIN

Notes on pink stains. EDWIN W. ADAMS. *Textile Colorist* 42, 851-3(1920); 43, 25, 34(1921).—Expts. show that neutral or slightly acid cotton duck exposed to vapors of $C_6H_5NH_2$ or other aromatics in presence of air will develop pink stains. Moisture accelerates the staining. Even a trace of alkali in the goods apparently inhibits the pink. Pink stains upon canvas-rubber shoes were no doubt caused by $C_6H_5NH_2$ accelerators used in the rubber, or C_6H_6 compds. in the rubber cement or shoe polish.

CHAS. E. MULLIN

Grinding and mixing apparatus in dyestuff manufacture. II. CHEMICUS. *Color Trade J.* 7, 136-42(1920); 8, 4-8, 97-101(1921).—Various com. types of grinding mills employing stones, vertical and horizontal, are briefly described and illustrated. Ball mills are used for comminution (and mixing also) of dry dyes. For wet grinding of pigments, or grinding and mixing with a vehicle at the same time, roll and flat stone mills are discussed. Roll mills whose adjacent rolls operate against each other are recommended for the prepn. of printers' inks, this form producing a combined crushing and dragging effect making for extreme smoothness of consistency. Illustrations of various types of ball-, pebble-, and roll-mills are given.

F. S. BEATTIE

Constitution of indigotin. R. ROBINSON. *J. Soc. Dyers and Colourists* 37, 77-81(1921).—A brief and rather general discussion of Thiele's theory of partial valences, as underlying the explanation of color in indigotin and some related compds. Structural formulas are largely introduced to clarify the statements made. The article closes with a summary of the discussion of the paper.

F. S. BEATTIE

Manufacture of the rhodamines. II. RAFFAELLE SANSONE. *Color Trade J.* 8, 181-5(1921); cf. C. A. 15, 1403.—The control tests necessary through the process are mentioned and several of the more important tests are described or suggested. The ethylamine process of manuf. is rather briefly described, and its advantages and drawbacks are pointed out. Various brands of rhodamines (3B, C, 3G, 5G, 6G, 12 GN, S) and their general mode of prepn. are mentioned.

F. S. BEATTIE

Uses of Turkey red oils. FREDERIC DANNERTH. *Textile World* 59, 3541-3(1921).—A study is reported of the properties, manuf., uses, substitutes and lab. tests of Turkey red oils. H_2O .—Melt 10 g. with 25 g. dry wax in 75 cc. satd. NaCl soln. Cool, dry and weigh the cake formed. Increase represents anhydrous oil and the difference between this and the wt. taken is H_2O . *Total fat*.—Weigh 4 g. into a tared dish with stirring rod. Slowly add 20 cc. H_2O and if turbid add NH_4OH until alk. to phenolphthalein. Add 15 cc. 1:1 H_2SO_4 , then 7 g. stearic acid and boil gently until the fat seps. clear. Cool and remove the cake formed with rod. Heat the aq. liquor in the dish to unite the remaining fat particles, cool these on the side of the dish, pour off the liquor and wash the dish with H_2O . Heat the caked oil in the dish gently, stirring until the crackling sound ceases and white vapors are evolved. Cool, weigh, deduct the wt. of dish, rod and stearic acid added; the result is total fat. *Neutral fat*.—Dissolve 30 g. in 50 cc. H_2O . Add 20 cc. NH_4OH and 30 cc. glycerol, and ext. the mixt. twice with 100 cc. Et_2O . Shake the ethereal ext. with H_2O to remove soap, distil off the Et_2O in a tared glass, dry and weigh. *Fatty acids*.—Calc. by deducting the neutral fat and sulfonated

acids from the total fat. By deducting 3.15% from this figure, the value of *acid anhydrides* is obtained. *Sol. sulfonated fatty acids*.—Dissolve 5–10 g. in 25 cc. H_2O . Add 25 cc. HCl and heat for 1 hr. at 140° . Dil. and filter off the layer of oil. H_2SO_4 in the filtrate is pptd. by $BaCl_2$. Deduct H_2SO_4 present as sulfates and calc. the remainder to ricinoleo-sulfuric acid. Factor, $\times 4.725$. *H_2SO_4 as alkali sulfates*.—Shake a soln. of the oil in Et_2O with a few cc. satd. $NaCl$ soln. Unite the aq. exts., dil., filter and ppt. *Nature of original oil*.—Det. the Ac and I numbers of the total fat, separated without the addition of stearic acid. With pure castor oil the Ac no. will be 140 or more, and the I no. will be 70 or less. *Alkalinity*.—The oil should be neutral or slightly alk. to phenolphthalein.

CHAS. E. MULLIN

Review of a report on sizing. WILLIAM R. CATHCART. *Textile World* 59, 2895–9 (1921).—An investigation upon the breaking strength, amt. of size added, stretch, and change in number of cotton warp, unsized, sized with a thick boiling "pearl" starch, a refined thick boiling alk. corn starch, or a thin boiling corn starch. Photomicrographs show penetration of, and fabrics sized with, the various starches.

CHAS. E. MULLIN

Spots and streaks in bleached and dyed cotton piece-goods. EMIL KIRCHER. *Deut. Farber-Zig.* 57, 383–4 (1921).—The causes, methods of avoiding, and methods of removing spots and streaks in cotton piece-goods are described. L. W. RIGGS

The tensile, the bursting, and the ripping strain of fabrics. I. HUBNER. *J. Soc. Dyers and Colourists* 37, 71–5 (1921).—H. believes tests of bursting and ripping strains give valuable information additional to and in some cases supplanting that given by tensile strain tests. The paper gives and compares data representing the highest mean and lowest mean results of a large number of tests, in both warp and weft directions, and tabulated as: (1) tensile strain, made on good brand machine, (2) bursting strain, obtained by bursting samples having a circular hole $1/8$ " diam., centrally located, with rubber diaphragms inflated by water, and (3) ripping strain, obtained on Schopper paper-testing machine, with plain fabrics only, the sample having a 2" slit cut in the desired direction of tear and the machine jaws moving 2" apart at uniform speed of 3" per min. Comparing bursting with tensile strain H. deduces that in fabrics of practically equal warp and weft strength the 2 strains are comparable, while in cases of unequal warp and weft strengths the bursting strain compares with tensile strain in the weaker direction and gives actual practical strength of fabric. The bursting test is more easily and quickly performed and with less cloth than the tensile strain. The ripping strain, as well as bursting strain, is valuable in studying effects of various processes upon strength of fabric, scouring, bleaching, mordanting, dyeing, starching, calendering, etc. Data are given for plain fabric and one set for a cotton vs. a linen fabric. A. K. J.

The separation of plant fibers by bacterial action. J. MICOL DE PORTEMENT. *Papier* 24, 224–5 (1921).—Brief outline of the action of various organisms in retting processes. A. P.-C.

Evaluation of Turkey red oil (HERBIG) 27. Cotton linters as raw material for the celluloid industry (BARTHÉLEMY) 23. Dibromoanthraquinones (BATTEGAY, CLAUDIN) 10. Dinitroanthraquinones (BATTEGAY, CLAUDIN) 10. The nature of the swelling process (KNOEVENAGEL) 2.

Grundlegende Operationen der Farbenchemie. Zürich: Schulthess & Co. 22 Fr. For review see *Z. angew. Chem.* 33, I, 15 (1920).

WOOD, JOHN K.: *The Chemistry of Dyeing*. London: Gurney and Jackson. 80 p. For review see *J. chim. phys.* 18, 448 (1920).

Treating fibers. J. H. PICKUP and G. A. WILSON. Brit. 161,600, Sept. 15, 1919. Fibers from the leaves of agave, yucca, etc., are obtained in a pliable state, suitable for spinning and for paper-making, by allowing the material to stand and ferment in H_2O for 2-4 days at 80-100° F. The liquid, which may contain citric acid and alc., is expressed. The material is then washed and treated with slaked lime, the liquid is again squeezed out, and the material, without washing, is boiled for 3-5 hrs. under 20-35 lb. pressure and subsequently washed and neutralized in an acid bath, or acid salt, such as $Na_2S_2O_4$, if the product is dark colored, or HCl , H_2SO_4 or $AcOH$. It is again washed and boiled under pressure with alkali for about 4 hrs., then washed and the alkali neutralized with acid or acid salt as before, again washed, dried, and passed through a breaker or carding machine.

Dyeing silk. E. L. MAUPAI. Brit. 161,625, Dec. 10, 1919. Raw silk threads are treated so as to harden the sericin sufficiently to resist the action of dyeing liquors while remaining permeable to dyes, is then dyed and woven, and the sericin layer finally removed. Preferably the hardening is effected by treatment with warm dil. mineral acids, followed by treatment with metallic mordants; the final removal of the sericin is effected by hot soap soln. Cf. C. A. 14, 1225.

Printing knitted goods. T. H. HINLEY. Brit. 161,700, Jan. 17, 1920. Knitted goods are printed in one or more colors by means of lithographic or letterpress transfers, which are printed with an ink composed of pigments, lithographic varnish, tallow, stearin, and paraffin wax. The transfer of the print to the goods is effected while the ink is still wet. Suitable ink consists of 1,000 parts of pigment, 100 parts of varnish, 1 part of tallow, 2 parts of stearin, and 10 parts of paraffin wax.

Spinning nozzles for artificial filaments. SUDENBURGER MASCHINENFABRIK UND EISENGIESEREI AKT.-GES. ZU MAGDEBURG ZWEIGNIEDERLASSUNG VORM. F. H. MEYER. Brit. 161,527, Apr. 8, 1921. Spinning nozzles for artificial filaments are formed of phenol-formaldehyde condensation products. A mold containing a bundle of parallel wires is filled with the condensation product, which is then hardened in the usual manner; the block is subdivided transversely into plates, from which the wires of Cu, Zn, Al, etc., are removed by soln. in acid or alkali, or by electrolysis.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Contributions from the Research Institute for Paint Technology of the Technical High School at Munich. A. EIBNER. *Chem.-Ztg.* 45, 469-72 (1921). See C. A. 15, 1627. F. A. W.

Nickel compounds as driers for oil and a note on nickel pigments. HENRY A. GARDNER. Paint Mfrs. Assoc. of U. S., *Circ.* 126, 9 pp. (1921).—When 1 lb. of linseed oil was added to 2 lbs. of $Ni(OH)_2$, the mass started to fume, and on stirring flames broke out in several places. When $Ni(OH)_2$ was added in small quantities at a time to linseed oil, the drying of the oil was accelerated, the paints contg. 40 to 80% pigment and applied to panels dried in 5 hrs., but the original pastes showed no hardening in the container after several days. This suggests the use of $Ni(OH)_2$ in certain black paints which dry too slowly. Paints made of Indian red, metallic brown, and other Fe oxide pigments in raw linseed oil all required at least 48 hrs. for drying, but addition of 5% $Ni(OH)_2$ reduced drying time to less than 24 hrs. Paints made of 40% $Ni(OH)_2$ with 60% soy or cottonseed oil dried in 38 to 48 hrs. instead of 4 to 5 days as with other pigments. Similar acceleration was found in white Pb-ZnO paints. Such paints contg. not more than 4% $Ni(OH)_2$ bleached white on exposure to the sun, but those contg. higher percentages merely became lighter gray in color. Solns. of fused and pptd. tungstates,

resinates and linoleates of definite concns. in linseed oil were prepd. In no case did Ni in any concn. up to 0.2% dry linseed oil in less than 48 hrs. O absorption tests show that Ni compds. in soln. in linseed oil do not act as active catalysts. Oils contg. 0.05% of Mn, Pb, or Co generally showed more rapid O absorption than those contg. higher or lower amts., so that poor drying of paints may be due to the use of excess drier. Oils contg. Pb showed greater continued and progressive absorption from the 6th to 9th days than other metals. The Ni salts examd. lack tinting strength, but the most promising as pigments are $\text{Ni}(\text{OH})_2$, which gives soft bluish undertones, $\text{NiO} \cdot \text{CrO}_3$, giving soft brown undertones when mixed with white, and Ni dimethylglyoxime, which more nearly approaches para or toluidine reds in color than other red mineral pigments. Some of the pigments might be of interest as glaze colors in vitreous enamels. Complete details of the tests are tabulated.

F. A. WERTZ

The grinding of colors with varnishes, oils, etc. ANON. *Farben-Ztg.* 26, 1699-1700, 1763-4, 1830-1, 1895-6 (1921).—Review of the general practice of paint grinding with a description of machinery, tabulation of % oil required for grinding pastes of the common pigments, etc.

F. A. WERTZ

Dekalin. EGON MEIER. *Farben-Ztg.* 26, 1765 (1921).—Although slightly higher in price, dekalin (*C. A.* 14, 357) is to be preferred to tetralin in paints and varnishes because of its higher evapn. rate, non-solvent action on linoxyn, freedom from discoloring white enamels, etc.

F. A. WERTZ

Substitutes for linseed oil in the paint industry. PERCIVAL J. FRYER. *Chem. Age* (London) 4, 496 (1921).—For general outside work especially on the sea coast, for use on hot surfaces, and on structural steel, a mixt. contg. as much as 75% menhaden oil with linseed oil is advantageous. Raw soy oil preferably blown and then heat-treated and admixed with metallic linoleates to contain Mn 0.03%, Pb 0.02%, and Co 0.01% dries almost as quickly as boiled linseed oil and produces nearly as good results. Mixts. of linseed oil with lumbang and perilla oil are probably more suitable for outdoor use than linseed oil alone. Among the oils from new sources, the most promising is *oilicia* from Brazil (*cf. C. A.* 12, 2056). This oil has such great drying properties that it offers the possibility of conferring drying powers to mixts. of it with non-drying oils.

F. A. WERTZ

Insulating varnishes. A. R. MATTHIS. *Chem. Age* (London) 4, 501 (1921).—Insulating varnishes are used to prevent the action of moisture, increase insulating properties, resist oils and acids, give better results through their high thermal conductivity, form a "monolith" with the app. (especially important in rotating parts), and to keep insulating windings elastic. The selection of a suitable varnish is governed by the specific purpose to be served. A brief description of impregnating coils and other app. by dipping and baking is given. The usual tests on a varnish include color, sp. gr., insol. matter, viscosity, penetration, character and quality of the thinners, acidity, resistance to oils, acids, and H_2O , action of heat, thermal cond., durability, and dielectric strength. For details of these tests see M's. book "Insulating Varnishes." Revarnishing of electrical app. even though in apparently good condition will increase its efficiency and prolong its life.

F. A. WERTZ

Preservation of chemical works plant and structures. G. B. JONES. *Chem. Age* (London) 4, 494-5 (1921).—A review of the necessity for protection of structures against corrosion by the use of suitable paints, varnishes, bituminous coatings, etc.

F. A. WERTZ

The preparation and uses of modern varnishes. P. R. KORKKOR. *Chem. Age* (London) 4, 499-500 (1921).—A review of the recent advances made in varnish manu. and of the various specialized uses, such as tin lacquering, protecting surfaces against alkali, etc., to which varnishes have been adapted.

F. A. WERTZ

Determination of benzene in turpentine. J. MARCUSSEN. *Chem.-Ztg.* 45, 418

(1921).—M. disputes Salvaterra's statement (*C. A.* 15, 1819) that M's. method for detg. benzine in turpentine by the use of fuming HNO_3 (*C. A.* 4, 1541) does not give accurate results.

F. A. WERTZ

Quantity production of insulating varnish. ANON. *Electrician* 86, 640-1(1921).—Insulating varnishes are classed as: baking oil-, air-drying oil- and air-drying spirit varnishes. For coils of armatures or rotating parts, the varnish film must have high dielec. strength, and be impermeable to moisture. Linseed oil is boiled with selected gums and a non-metallic drier. For stationary parts careful selection is not quite so vital, though the dielec. strength must be high. The suitability of a varnish for insulation purposes is detd. by a dielec. strength test, an aging test, and tests on the coils. The latter consist of the time for drying, measurement of insulation resistance between parallel conductors under various conditions, the penetration and the internal drying properties, and the tendency to discolor when the coils are subjected to heat and moisture. The dielec. strength is detd. by dipping a strip of paper 0.001" (0.025 mm.) thick in the varnish to be tested and detg. the breakdown voltage of the varnish film. The paper is given two dips and is drained in the opposite direction between dips. In the case of baking varnish the paper is baked between dips in an elec. oven. For the aging test, a piece of the varnished paper is left at 80° till it breaks when doubled over and the time required noted. A careful check on raw materials is necessary.

W. H. BOYNTON

Progress in the manufacture of rosin varnish. CH. COFFIGNIER. *Chimie & industrie* 5, 495-9(1921).—Brief outline of the effects of treating the rosin with metallic oxides or lime (Fr. patents 162,098, 1884, and addition in 1885; 188,227, 1888), of esterifying the rosin (with glycerol) (Fr. patent No. 164,486, 1884, and additions in 1886 and 1890), of substituting China wood oil for part of the linseed oil, and of the use and function of furfural in the varnish.

A. P.-C.

The constitution of aleuritic acid. HANS WOLFF. *Farben-Ztg.* 26, 1573(1921).—W. reviews Tschirch's original isolation and identification of aleuritic acid from shellac (see *Die Harze und Harzbehälter*, Tschirch, 1906). Identification of this acid for the detection of shellac when present in rather large quantities is made by sapon. of the resin mixt. with alc. alkali diln. with 10-15 vols. of boiling H_2O , acidification with d.l. H_2SO_4 , filtration hot, collection of the crystd. acid from the filtrate and detn. of its m. p. and acid no., and the formation of its characteristic Mg salt

The constituents of pine resin (DUPONT) 10.

HOLLEY, C. D.: *Analysis of Paint Vehicles, Japans and Varnishes*. New York: John Wiley and Sons, Inc. 203 pp. 13s. 6d.

ZIMMER, FRITZ: *Handbook of Varnishing and Decorating*. Union Deutsche Verlagsgesellschaft. 2nd Ed. Berlin, 1921. Reviewed by Hans Wolff. *Farben-Ztg.* 26, 1893(1921).

F. A. WERTZ

Paints. C. H. IVINSON and G. S. ROBERTS. *Brit.* 161,201, July 12, 1919. To paints composed of dissolved asphalt, and oleates or stearates of metals, rubber is added and the whole is vulcanized by means of S or a suitable S compd. and heat. Palmitates, linoleates, or resinates may be used instead of oleates or stearates. Inert substances such as SiO_2 , asbestos, or graphite may be added. Cf. *C. A.* 13, 2198.

Distempera. H. FREUDENBERG. *Brit.* 161,032, Feb. 9, 1920. A mixt. of lime common salt, plaster of Paris, and H_2O is applied to old paint coatings to facilitate the application of a new coat.

Lithopone. R. LE BAKER. *Brit.* 161,280, Jan. 6, 1920. In the prepn. of litho-

pone by the mutual pptn. of ZnSO_4 and BaS , the ZnSO_4 soln. is first freed from Fe by a preliminary heat and oxidation treatment in the presence of an alk.-earth peroxide such as BaO_2 or CaO_2 and of PbO or ZnO . A suitable construction is specified.

Coating materials; plastic compositions; coated fabrics; joint-making packing. J. A. LOCKE. Brit. 160,801, March 24, 1921. A coating (a) for shingle consists of: Portland cement, asbestos fiber, resinate of Mn, water-gas tar, linseed oil, naphtha or benzene, Na silicate soln., and menhaden oil. A "truck" coating consists of: H_2O -gas tar, menhaden oil, resinate of Mn, and naphtha or benzene; any drier and a "special" pigment may be added. The special pigment consists of the ingredients of coating (a) with the addition of "mineral red colors." Coatings for Fe and smoke stacks consist of water-gas tar, menhaden oil, resinate of Mn, naphtha or benzene with or without a drier, and the special pigment (without the linseed oil). A marine coating is similar in compn. but contains soy-bean oil; a coating for hulls of ships is also similar except that a drier is essential. A coating for canvas is similar to the marine coating except that a drier is optional and linseed oil is not omitted from the special pigment. A coating for decks of ships consists of water-gas tar, menhaden oil, resinate of Mn, naphtha, a drier, linseed oil, and, if desired, the special pigment. A caulking compn. consists of soy-bean oil and resin, water-gas tar, menhaden oil, Na silicate soln., hydraulic cement, and asbestos. An insulating paint consists of water-gas tar, menhaden oil, resinate of Mn, benzene, a drier, portland cement, asbestos, and soy-bean oil. A pasty insulating compn. for making blocks and joints consists of the same materials as the caulking compn. with the addition of resin and resinate of Mn. An impregnating compn. has the same constituents as the coating (a) except that menhaden oil is substituted for linseed oil and that Na_2SiO_3 is added. The fabric after impregnation is passed beneath a hopper from which is fed a mixt. of asbestos and portland cement, which is then pressed into the material by heated rollers. An impregnating material for brown paper has the same ingredients as the insulating compn. except that MgO and a drier are added and resinate of Mn is omitted. A suitable drier consists of benzene, soy-bean oil, and MnO_2 .

27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

Oils, fats and waxes in Latin America. OTTO WILSON. *Chem. Met. Eng.* 24, 1101-8(1921). E. H.

Determination of the acetyl index of fats. EMILIE ANDRE. *Compt. rend.* 172, 984-6(1921).—The Intern. Congress of Applied Chemistry at Rome in 1907 adopted Lewkowitsch's method of detg. the acetyl index of fats. It is the no. of mg. of K necessary to sat. the AcOH obtained by sapon. 1 g. of acetylated fat. A. has found a simpler method for this detn. It is possible when the sapon. no. (S) of a fat is known and also the sapon. no. (S') of the acetylated fat to calc. its acetyl index. $S' - S$, which is called A , does not represent the acetyl index; 1 g. of acetylated oil does not contain 1 g. of oil, for the acetylation has added to the wt. and the amt. to deduct from S' is not the potash S but a lesser amt. If A_1 is the actual value of the acetyl index, $S' - S$ is a lesser unknown value. There exists among A_1 , S , and A a simple relation from which one can calc. the third member when the first two are known. This relation is established as follows: acetylating an alc. is to replace an OH group whose g. mol. wt. is 17 g. by the group CH_3COO whose g. mol. wt. is 59 g., thus increasing the wt. of the mol. 42 g. To saponify 1 g. mol. 56 g. of KOH are necessary and 1 g. of acetylated fat requires 0.056 g. of KOH , equiv. to $1 - 0.042$ g. of the original alc. One g. of acetic ester requires n g. of KOH and therefore $1 - (n/0.056) \times 0.042 = \text{g. of alc.}$ By taking λ as the re-

lation 42/56 by which the sapon. no. of an acetic ester should be multiplied to det. the "acetic surcharge" of the alc. from which it is derived and knowing λ , S and S' one can calc. A from the formula $A = S' - S \left[1 + \frac{\lambda S}{1 - \lambda S} \right]$. Two samples of castor oil gave 146.9 and 137.2 by Lewkowitsch's method and 144.1 and 136.1 calcd. from the above formula. Five samples of raisin seed oil gave concordant results by the 2 methods. Also in *Bull. soc. chim.* 29, 745-52(1921).

E. SCHERUBEL

Relations between the fat and asphalt industries. J. MARCUSSE. *Z. deut. Ol-Fett-Ind.* 41, 225-6(1921).—The pitch obtained from the distn. of fatty acids differs from natural asphalt and petroleum pitch by its high content of saponifiable matter. It also contains hydrocarbons, asphaltenes, ketones, Cu soaps and S compds. The higher the distn. temp. the more hydrocarbons are formed. Analyses of 3 samples of stearin pitch and one of wool-fat pitch are given, together with the analytical method: 5 g. are dissolved in benzene and sapond. by heating 30 min. under a reflux condenser with 25 cc. N KOH; 50 cc. of 96% alc. are added and the whole is neutralized with 0.5 N HCl and evapd. dry with addition of sand. It is extd. with acetone in a Soxhlet. Hydrocarbons and petroleum resins dissolve while asphaltenes and soaps remain behind. The last named are detd. by boiling with 50% alc., evapg. and decomp. with dil. acid, yielding the total fatty acids of the soaps present. The asphaltene may be extd. with benzene.

	M. P.	Free Acid.		Sapon.	%	%
		(Krämer-Sarnow).	Acid. No.	Oleic.	Sapon.	Unsapon.
Stearin pitch <i>a</i>	74	25.0	13	102	87	13
<i>b</i>	41	23.1	11.6	55	38	62
<i>c</i>	..	17.2	...	50	24	76
Wool-fat pitch	33	6.5	3.3	41	29	71

The saponifiable matter consists mostly of fatty anhydrides. The portion insol. in petr. ether behaves like oxidized acids and their anhydrides and differs from cryst. hydroxy acids, like hydroxystearic, by having a viscous and asphaltic consistency. These oxidized acids have probably formed by the addition of 2 O atoms to the double bond of an unsatd. acid, forming an intermediate peroxide which is still sol. in gasoline but which on alc. sapon. and acidification yields acids insol. in gasoline. The oxidized acids have a high acetyl value, showing the presence of OH groups; but a portion of the O lies in a ring compd. because concd. H_2SO_4 or fuming HNO_3 forms addition compds. in the cold while hydroxystearic acid forms acid esters under these conditions. One Germ. and one Brit. patent are mentioned which utilize fatty-acid pitch for roofing and insulating material. Results of analyses of products presumably made according to these patents are briefly stated.

P. ESCHER

Apparatus for the routine determination of melting-point of fats and fatty acids. S. H. BLICHFELD and T. THORNLEY. *Analyst* 46, 180-2(1921).—"By m. p. in this method is understood the temp. at which a column of fat of specific dimensions begins to move in an open tube of specified dimensions under a definite hydrostatic pressure." The sample to be tested is melted and drawn up into a clean glass tube "6.5 cm. long, 1 mm. bore and 3 mm. diam." for exactly 1 cm. It is then solidified by placing the tube between 2 blocks of ice and allowing it to remain there 2 hrs. The tube with solid fat is then submerged vertically in a bath of water until the top of the sample is 1 cm. below the surface of the water. The bath is heated at the rate of 1° per min. and the temp. at which the sample begins to rise taken as the m. p. A cut of an app. heated by submerged elec. lights is shown. In this a number of samples can be run at the same time.

H. S. BAILEY

Evaluation of Turkey red oil by the volumetric method. W. HERBIG. Chemnitz. *Z. deut. Öl-Fett-Ind.* **41**, 257-9(1921).—While the manufacturer wants to know the product-yield on the basis of his original oil, the consumer wants to know the content of total fat and of sulfonic acid. For the exact detn. of total fat boiling with HCl to the complete splitting off of sulfonic acid is alone to be considered. H. considers the remote possibility of the formation of diricinic acid by the combination of sulfonic acid with one mol. of ricinic acid. Such a compd. can only be decompd. by boiling with caustic, forming an alkalisulfonate, and subsequent boiling with HCl, but such diricinic compds. would not behave like sulfonic acid, and the role of Turkey red oils in dyeing is not fully cleared up. The gravimetric detn. for control-work in the factory requires too much time, but by the use of Röhrig's app. it can be finished in 1 to 1½ hr. and furnishes results that agree with the method of ether-shaking in the separatory funnel. H. tabulates 17 results on one sample of Turkey red oil by Sprenger's volumetric method (*Textilberichte* 1920, p. 6), which varied between 62.26 and 66.04% against 59.52% by the gravimetric method. The sp. gr. of the fatty acids was in this case 0.952 as against the customary standard of 0.945. H. considers the volumetric method decidedly unreliable.

P. ESCHER

The oil of South African Maroola nuts. ANON. *Bull. Imp. Inst.* **18**, 481-3(1920).—The maroola nut is the product of *Sclerocarya caffra*. The kernels contain 5% moisture and yield 56.2% oil (equiv. to 59.2% on the dry kernels). The oil is pale yellow and possesses the following properties: d_4^{20} 0.9167, n_D^{40} 1.460, m. p. of fatty acids 25°, acid value 3.7, sapon. value 193.5, I value 76.6%, sol. volatile acids 0.1%, insol. volatile acids 0.45%, unsaponifiable matter 0.6%.

R. L. SIBLEY

The commercial utilization of perilla seed. ANON. *Bull. Imp. Inst.* **18**, 479-81(1920).—These seeds were obtained from plants grown on soil treated with a chem. fertilizer contg. 6% N, 8% H_3PO_4 and 8% K_2O , which was used at the rate of 98 lbs. per plot of 10 rods sq. The yield of seeds was 450 lbs. per acre. The seeds contd. 6.3% moisture and yielded 43.1% oil (equiv. to 46.0% oil from the dry seed). The oil possessed the constants d_4^{20} 0.9298, n_D^{40} 1.472, sapon. value 190.5 and I value 185%. The residue left after extrn. of the oil was a fine grayish white meal with a slight but pleasant taste and contained moisture 9.6%, crude proteins 38.1%, fat 0.5%, carbohydrates 20.8%, fiber 20.2%, ash 10.8%, food units 117.

R. L. SIBLEY

Rancidity of butter and margarine fats (STOKOE) **12**. Uses of Turkey red oils (NERTH) **25**. Formation of petroleum from fish oils (KOBAYASHI) **22**.

COPELAND, E. B.: *The Coco-nut*. 2nd Ed. London: Macmillan and Co. 225 pp. 20s. net. For review see *Nature* **107**, 391(1921).

FRANCK, H. HEINRICH: *Die Verwertung von synthetischen Fettsäureestern als Kunstseifefette*. Braunschweig: Friedr. Vieweg und Sohn. 96 pp. M 6.40. Teuerungszuschlag. For review see *Seifensieder-Ztg.* **48**, 378(1921).

HURST, GEORGE H.: *Textile Soaps and Oils*. 3rd Revized Ed. London: Scott Greenwood and Sons. 10s. 6d. net. For review see *Chem. Trade J.* **68**, 687(1921).

Öl-Adressbuch 1921. Dortmund. Verlag für Technik und Chemie, K-G. 216S. M 45. For review see *Seifensieder-Ztg.* **48**, 452(1920).

Seifen-Industrie Kalender 1921. Leipzig: Verlag von Eisenschmidt und Schulze. For review see *Z. deut. Öl-Fett-Ind.* **41**, 360(1921).

WILTNER, FRIEDR.: *Die Fabrikation der Toiletteseifen und der Seifenspezialitäten*. 3rd Ed. revized and enlarged. Wien: A. Hartlebens Verlag. M 24 + 20%. For review see *Z. öffentl. Chem.* **27**, 108(1921).

Recovering catalysts. SOC. ANON. L'OXYHYDRIQUE FRANÇAISE. Brit. 180,428.

March 19, 1921. Catalysts are removed from treated oils or fats by filtering through asbestos porcelain or biscuit porcelain. The temp. and pressure may be raised e. g., to 200 and to 1, 2, or 3 kg. per sq. cm.

Synthetic fats. G. SCHICHT AKT.-GES and A. GRUN. Brit. 160,840, Mar. 31, 1921. Fats resembling natural fats such as lard and butter are obtained by esterifying with glycerol by known methods mixts. of the fatty acids from butyric acid upwards. In order to obtain mixed glycerides without the formation of triglycerides of particular acids, a monoglyceride of one acid may be first prepd., this converted to a diglyceride with a second acid and to a triglyceride with a third. The acids may be employed as such or as anhydrides, acid chlorides, or "acid esters." In place of glycerol may be used glycerol halohydrins, "glycerine sulfuric acid," epihalohydrins, epihydrin alc., "amino-glycerines," etc. The method may be applied to "natural fats" and in "improving hardened fats which contain tristearin and trihehenin." Cholesterol, lecithin, vitamins, and natural coloring matters such as carotin and xanthophyll may be added to the products.

Purifying oils. A. S. QUICK. Brit. 161,813, March 20, 1920. Animal and vegetable oils are purified by agitation with H₂O and monazite sand, preferably at a temp. of about 120° F. In an example, 20 gal. of H₂O and 10 lb. of monazite sand are added to 20 gal. of linseed oil, and air is blown through the mixt. for 6 hrs. After it has settled for four hrs. the oil is sepd. in the usual manner.

Cleansing compositions. G. F. CHADBOURNE. Brit. 160,892, Dec. 1, 1919. A saponaceous compn. is made by mixing with melted fatty acid a hydrated Al silicate, or china clay or other mineral contg. a large proportion of such silicate, and afterwards saponifying with alkali. The preferred proportion of china clay, etc., is 20-50% of the finished product.

Cleansing compositions. H. RHODES. Brit. 161,867, June 16, 1920. A cleansing compn. that lathers with sea water is prepd. by mixing fat, pumice powder, whitening, plaster of Paris, gum tragacanth, kerosene, and concd. soda soln., with or without oil of citronella or other perfume. For a soap for general purposes the fat consists of about equal parts of bone grease and Australian tallow; for toilet soap, cooking-fat is used.

Molding soap, etc. PALEY ENGINEERING CO. Brit. 161,160, Mar. 16, 1921. Soap, wax, gelatin, cacao butter, etc. are formed into cakes by running the hot fluid material into molds which are conveyed through a cooling chamber, where the material is solidified by cooling below 25°. After cooling, the cakes may be stamped before discharge and are then conveyed to wrapping apparatus. A suitable construction is specified.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Recent progress in the field of sugar manufacture. HERZFELD. *Deut. Zuckerind.* 46, 268-9(1921). F. W. ZERBAN

Preliminary note on changes in Bulletin No. 11. W. D. HELDERMAN. *Arch. Suikerind.* 29, 387-92(1921).—The changes refer to the *official methods* published by the Java Sugar Expt. Station. F. W. ZERBAN

Cane cultivation in Dutch Guiana. C. A. B. *Intern. Sugar J.* 23, 252-4(1921).—This is a summarized translation, with comments, of an article in Dutch by F. A. F. C. Went, on methods of cane culture in Surinam as compared to those used in Java. F. W. ZERBAN

Cost of production of sugar in Mauritius. HENRI ROBERT *Intern. Sugar J.* 23,

273-6(1921).—A statistical table, with comments on the effect of the world's market, of crop conditions, cost of materials and labor, and of the war. F. W. ZERRAN

Experiments on the use of zinc hyposulfite in the sugar factory at Meaux. E. SAILLARD. *Circ. hebdom. synd. fabr. sucre*, April 10, 1921; *Deut. Zuckerind* 46, 258(1921).

—Five g. of Zn hyposulfite, made by dissolving Zn in a satd. SO_2 soln., were added per 100 l. of juice which had previously been limed to an alkalinity of 7-8 g. CaO per l. Then 22 g. more CaO were added and the juice was satd. The hyposulfite had no effect on the compn. of the massecuites and runoffs; but the molasses was exhausted further, to 61.7 purity instead of 64.3. No definite conclusions can be drawn as yet.

F. W. ZERRAN

The manufacture of sugar in the form of cones. ALES LINSBAUER. *Listy Cukrovár.* 39, 45-8(1920).—An analysis of the time required for the complete operation is given, taking one centrifugal of 24 cones capacity as a unit. The analytical data and yield figures are also appended.

JOHN M. KRNO

Saccharogenic content and selection of sugar beets. A. VIVIEN. *Bull. assoc. chim. suc. dist.* 38, 143-63(1920).—A review of the saccharogenic content and of the methods used in selecting sugar beets, since 1850. Numerous but not complete references are given.

I. D. G.

An analytical method for estimating the percentage of defecation scum from sugar cane without weighing the press cake. A. V. *Bull. soc. chim. Maurice* 11, 53-6(1921).—The quantity of scum resulting from the coagulation of albuminous matter and its pptn. with fat is seldom accurately known since its weighing is intrusted to secondary employees. To det. this factor in the lab., weigh a portion of the dil. juice each time a sample is brought to the lab. Pour it into a cylinder of wire gauze No. 100, 12 or 15 cm. high and 5 cm. in diam. This retains the fiber. Wash well and transfer to a tared basket of perforated Cu 15 cm. in diam. and 5 cm. high. Cover with a wire gauze such as the cylinder is made of. When all of the day's samples are finished press them out on the lab. press. Dry for about 4 hrs. and weigh. Empty all samples into a common receptacle and repeat all operations with samples of the scum. Det. ash, fat and protein in a composite sample of each, since these will be higher in the fiber from the scum than that from the juice. The calcn. is illustrated by the following example: Fiber in dil. juice 0.109%, apparent fiber in the scum 4.64%, water in dil. juice 20%, juice in cane 77.69%, excess ash, fat and protein in fiber from scum over that from juice 7.7%. Actual fiber in scum $4.64(100 - 7.7) / 100 = 4.28\%$. Kg. dil. juice per 100 kg. scum $4.28 \times 100 / 0.109 = 3926$. Kg. normal juice per 100 scum $3926 \times (100 - 20) / 100 = 3140.8$. Percent scum in cane $100 \times 77.69 / 3140.8 = 2.473\%$. I. D. GARARD

Note on the influence of bagacillo and the treatment of the low-grade massecuites. HERBERT WALKER. *Intern. Sugar J.* 23, 258-9(1921).—Efforts should be made to get a mixed juice as free from bagacillo as the necessary cost will justify. This would not only lead to better results in the boiling house, but also increase the available amt. of fuel. A 100-mesh screen would probably not be too fine, and would leave enough fiber particles in the juice to act as a filter aid.—The repeated reboiling of molasses has, in itself, no effect on the ash content of the sugar made, the latter being detd. almost entirely by the ash in the juice and the polarization of the sugar. The two desirable features in a raw sugar, large grain to facilitate drying, and large crystal surface to facilitate crystn. in the massecuite, are mutually exclusive. It is more important to strive for the latter; the former will require more pan and crystallizer capacity. The amt. of molasses reprocessed cannot be judged by the purity of the remelt alone, but that of the massecuite from which it was made must also be considered. F. W. ZERRAN

Problem of the decomposition of sucrose during milling. J. N. S. WILLIAMS. *Intern. Sugar J.* 23, 271-2(1921).—It is probable that in the modern mill, with its powerful action and with compound maceration, using filter-press wash waters and con-

lensation waters, decompn. of the sucrose takes place. This is in line with the observation that cane juice extd. by diffusion is always a little lower in purity than first-mill juice, but several points higher than the mixed juice obtained in compound milling. The figures from two pairs of factories show that those having the higher extn. delivered less sugar per ton of cane from the mills than those having lower extn., in spite of the fact that those having higher extn. were also handling richer cane. The conclusion seems inevitable that decompn. takes place in the mills. Even if the final report should show small losses, this does not prove anything against decompn. of sucrose, because there is no direct detn. of sucrose in cane. This matter needs further investigation.

F. W. ZERBAN

Inhibiting effect of amino acids on the inversion of sucrose by hydrogen ions. J. W. L. VAN LIGTEN. *Arch. Suikerind.* 29, 356-9(1921).—Just as the acid nature of amino acids is shown by the fact that in their presence larger quantities of alkali are necessary to produce decompn. of reducing sugars (cf. *C. A.* 15, 2009), so their basic nature is demonstrated by their inhibiting effect on the inversion of sucrose by strong acids. 500 mg. of aspartic acid were found to prevent the inversion of sucrose by 5 cc. 0.1 *N* HCl in 100 cc. soln. with 3 hrs. heating at 50°. By a series of similar expts. the basicity of a given amino acid can be detd.

F. W. ZERBAN

The effect of press cake washing on the recovery. ASKAN MÜLLER. *Deut. Zuckerind.* 46, 269-70(1921); cf. *C. A.* 15, 325.

F. W. ZERBAN

Decolorizing carbons of vegetable origin and their utilization in the cane-sugar industry. JAR. DĚDEK. *Listy Cukrovár.* 39, 26-30(1920).—A summarizing and historical treatment of the topic.

JOHN M. KRNO

A saving in the amount of lime used during saturation. JAR. SILHAVÝ. *Listy Cukrovár.* 39, 19-20(1920).—By using Macas's method of satn. the amt. of lime used was kept at a minimum. The advantage of this method of satn. is in the fact that there is only one carbonation. The pre-satd. lime used is produced from the excess CO₂ escaping during the satn.

JOHN M. KRNO

Nondefecable juice. Causes and remedies. Defecation is only a question of heating. CH. MÜLLER. *Bull. assoc. chim. suc. dist.* 38, 239-47(1921).—Expts. were carried out to det. the cause and correction of the difficulties encountered in defecation of cane juice. From them M. concludes that there exist in certain canes for diverse reasons not well defined, org. silica compds. These are sol. in alkali oxides and alk. earths at certain periods in the plant's life and insol. at others. These compds. are broken up by superheating at 116° which frees the silica precipitable by CaO and coagulates the org. matter. The gums are completely pptd. by the heating. The amt. of CaO necessary after the heating is about that for normal juice. The method is an improvement on that of Deming which involves heating at 120° for 1 min. In growing the cane, opportune time of planting, sound cuttings, good drainage, aeration of the soil, reasonable irrigation, moderate use of nitrogenous fertilizer are recommended. If the soil is clayey NaNO₃ should be replaced by Ca(NO₃)₂ or better by (NH₄)₂SO₄. At the factory no remedy is possible if the cane has been injured by heat or cold, for the removal of sol. Ca(OAc)₂ is impossible. Carbonation of the soln. at 3 or 4 atm. or sulfitation after decantation may help. When the cane contains an excess of sol. silica it must be heated to 116° and then CaO must be added.

I. D. GARARD

Additional notes on the economical juice-purification method of Psenicka. ED. PSENIČKA. *Listy Cukrovár.* 39, 1-3(1920); *Z. Zuckerind. Cechoslov. Rep.* 45, 49-51(1920).—The claim is put forth that by this method more org. color compds. are pptd. and a saving in lime, steam consumption and filtration materials results from its use. A diagram of the installation is given.

JOHN M. KRNO

The flow of juices in the diffusion battery. J. POKORNÝ. *Z. Zuckerind. Cechoslov. Rep.* 45, 17-20, 25-8, 33-6, 41-5(1920).—Mathematical equations are developed

to show the effect of the height and circumference of the diffuser on the amt. of juice flowing in a unit of time from the battery to the satn. station. The effects of friction and other factors on the flow of the juices are considered mathematically and actual examples are given.

JOHN M. KRNO

Recording apparatus for the automatic juice weigher, Adam patent. H. M. Vos. *Arch. Suikerind.* 29, 355-6(1921).—This consists of a bell jar placed near the bottom of the weighing tank, and connected through a Cu tube with a registering lever. When the juice rises in the tank the air pressure created lifts the lever up. As soon as the tank tips over and empties itself the air pressure is released and the lever falls back. A pen point on the tip of the lever makes a permanent record, which shows how speedily the tank is filled, how often it is emptied, when the mill is stopped, and when a tank tips over before being completely filled.

F. W. ZERBAN

The inversion and determination of cane-sugar (Rossg) 7.

Lactose. J. TAVROGES, J. W. ROCHE and G. MARTIN. *Brit.* 161,887, July 22, 1920. In manufg. lactose from whey, the lactalbumin is pptd. by the addition of a substance which produces in the whey a suitable colloid. It is suggested that the pptn. is due to the production of a negatively electrified colloid in the presence of the albumin. $\text{Na}_2\text{S}_2\text{O}_4$, yielding colloidal S, is suitable. The whey may be heated to 70-80° before the precipitant is added.

29—LEATHER AND GLUE

ALLEN ROGERS

Tanning materials of the future. E. C. KLIPSTEIN. *Hide and Leather* 61, 59 (1921); *Shoe and Leather Rep.* 142, 49(1921).—At the present rate of destruction of chestnut and quebracho forests, the supply of tanning materials from these sources will be practically exhausted in 20 years. A famine can be avoided by planting wattle trees, which flourish wherever oranges grow. They mature in 8 years sufficiently to furnish bark and once a plantation is established the plant propagates itself so rapidly that the supply of bark becomes annual after the first 8 years. For tanning it is claimed that this bark is as good as oak and superior to quebracho. This is an excellent means of reclaiming some of our waste lands and would make America independent of the rest of the world for tanning materials, especially if the use of wattle were supplemented by synthetic materials.

J. A. WILSON

Modern arrangement and operation of a leather-glue factory. GG. ILLERT. *Chem. App.* 8, 78-9(1921).—Description with 6 cuts of I.'s scheme for carrying out the steps of washing, pressing, chopping, boiling, filtering, concg. and drying glue made from waste hides, etc. The washing app. is his own device. It consists of 4 rectangular tanks at different elevations. Each tank has 2 stirrers, 90-100 r. p. m., and the sides are provided with galvanized wire screens of 2 mm. mesh. A perforated false bottom has conical holes with small end up, those toward the discharge end of the washer being 1.5 mm. diam. at the small end, and the others about 3 mm. diam. An elevator at the end of each tank carries the material to the next above. H_2O at 8-12° is used in the lower 2 tanks, and at about 35° in the upper tanks. The remaining steps in the process are carried out in standard app.

J. H. MOORE

Isinglass, ichthyocolla, fish glue. ANON. *Farben-Ztg.* 26, 1913-4(1921).—Isinglass is designated according to its form or its geographical source. The various grades and brands are described in detail. Substitutes for the genuine isinglass usually consist of dried fish roe, sheep gut, etc.

F. A. WERTZ

The nature of the swelling process (KNORVENAGEL) 2.

Catechin; catechu-tannic acid. F. H. BRAY. Brit. 161,431, Mch. 24, 1920. A process for the extn. of catechin and catechu-tannic acid from vegetable substances contg. them consists in digesting the disintegrated raw material with hot H_2O in the absence of air and preferably in an autoclave, filtering and concg. the decoction, then cooling it in absence of air to allow the catechin to sep. out, and finally evapg. the filtrate to dryness in absence of air and preferably *in vacuo* to obtain the catechu-tannic acid. The pptd. catechin is purified by washing with cold H_2O and is then dried in the dark either by a current of hot air or by absorption of the contaminating liquid by means of sand contained in bags. As starting material, the wood of *Acacia catechu* or *Acacia sendra* and the leaves and shoots of *Uncaria gambier* are mentioned.

30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

Ceara rubber from the Sudan. ANON. Bull. Imp. Inst. 18, 483-4(1920).—Samples of light, medium, dark and scrap Ceara rubber gave on analysis a loss on washing 1.7 to 6.2%, the dry washed rubber contained caoutchouc 83.7 to 92.1%, resin 3.8 to 4.1%, proteins 2.9 to 6.9%, ash 1.2 to 5.3%. These results show the rubber to be of good marketable quality.

R. L. SIBLEY

Need for washing freshly prepared sheets. F. C. VAN HEURN. Arch. Rubbercultuur 5, 187-95(1921).—A white stripe to be seen in certain rather thick samples of smoked sheet is due to the presence in the middle of the sheet of an undue amt. of serum solids, which are hygroscopic.

G. S. W.

Testing latex as a check on the condition of the trees. O. DE VRIES. Arch. Rubbercultuur 5, 178-86(1921).—The paper indicates how, by means of sp. gr. detns. on the possibly dild. latex delivered at the factory from a given plantation area, evidence can be obtained as to whether the latex as it came from the trees has a rubber content too low and a serum sp. gr. too high and hence as to whether the trees are being tapped too severely. (Cf. C. A. 13, 386, 2779.)

G. S. WHITBY

VRIES, O. DE: Estate Rubber: Its Preparation, Properties and Testing. Batavia: Ruygrok and Co. 649 pp. 20 fl.

VAA8, W.: Die Kautschukwarenindustrie Deutschlands. Berlin: Verlag Union Deutsche Verlagsgesellschaft. For review see Chem.-Umschau 28, 124(1921).

Rubber compositions. S. J. PEACHEY and A. SKIPSEY. Brit. 160,499, Nov. 4, 1919. Mixts. of rubber with lake pigments or fillers, such as sawdust, leather waste, cork dust, wool waste, etc., which are injured by known vulcanization processes, are vulcanized in the cold by alternate treatment with SO_2 and H_2S , as described in 129,826. (C. A. 13, 3040.)

Rubber compositions. H. WADE. Brit. 161,482, July 6, 1920. Glue contg. insufficient H_2O to render it plastic at ordinary temps. is incorporated with unworked rubber in a mixing machine, the action of which produces sufficient heat to render the materials plastic, whereby a homogeneous mixt. is obtained. Preferably the temp. is allowed to rise to about $280^\circ F.$, so that much of the contained H_2O is evapg. and the product can be vulcanized without subsequent drying. Air-dry glue containing 5-15% of H_2O is a suitable ingredient.

Rubber compositions. H. WADE. Brit. 161,483, July 6, 1920. Finely divided

solids, such as C black or ZnO, which are added to rubber as pigments or fillers, are first mixed with a soln. of glue or other colloid, which has been emulsified by means of a volatile liquid such as benzene or toluene. The emulsion is then mixed with the rubber, and the volatile liquid is removed during the subsequent drying process.

Heating rubber. H. GARR. Brit. 161,648, Jan. 9, 1920. In the heat treatment of rubber, etc., for reforming or vulcanizing, a soln. is employed which boils at or slightly above the temp. required, the soln. being at or slightly below the b. p. Solns. of CaCl_2 of various strengths are preferred, the b. p. of which rises approx. 10°F . for every lb. of salt for 3 pints. of H_2O . Several forms of appi. are described. Articles or molds containing them may be immersed directly in the liquid, or placed in a jacketed vessel, the jacket of which contains the soln. directly heated or circulated from an outside heater. Hollow bodies may have the hot soln. pumped into their interiors.

Regenerating rubber. O. R. BOUVIER and F. P. CONORT. Brit. 160,779, March 18, 1921. Vulcanized rubber, etc., is ground up, mixed with about 10% by wt. of H_2O containing 2% of glycerol, and 2% of paraffin in powder or small fragments. The mixt. is heated until the reaction sets in. The process may also be applied to new natural or imitation rubber, gutta-percha, resinous rubber, etc. It produces a product of increased plasticity and dielectric power.

Devulcanizing waste rubber. C. F. WILLARD. Brit. 159,987, Dec. 9, 1919. Rubber is devulcanized by means of an emulsoid colloid soln. in H_2O of tar, pitch, resin, gum, or balsam, preferably wood tar. The ground rubber is boiled up with this soln. a S solvent such as turpentine, and a detergent alk. soln. The detergent soln. may be employed along with the other solns., or in a subsequent operation. Any known S solvent may be used, or alc. may be employed instead. The boiled rubber is washed and dried, after which it can be subjected to any ordinary treatment. Fiber may be destroyed or sepd. in any known way. Cf. C. A. 14, 367, 368.

